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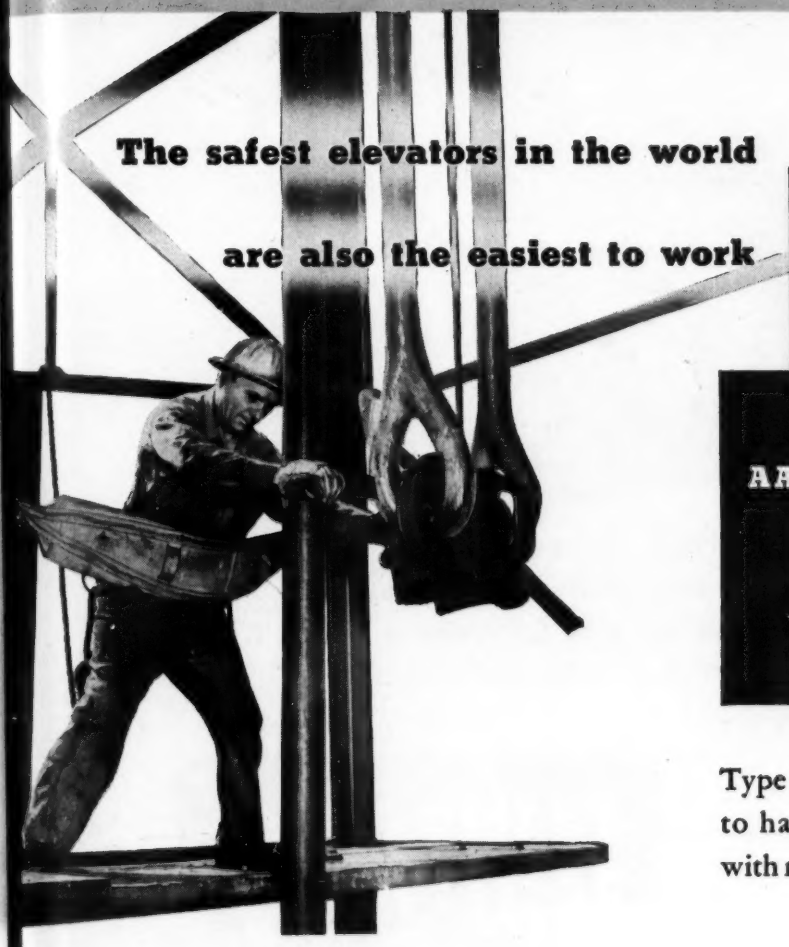

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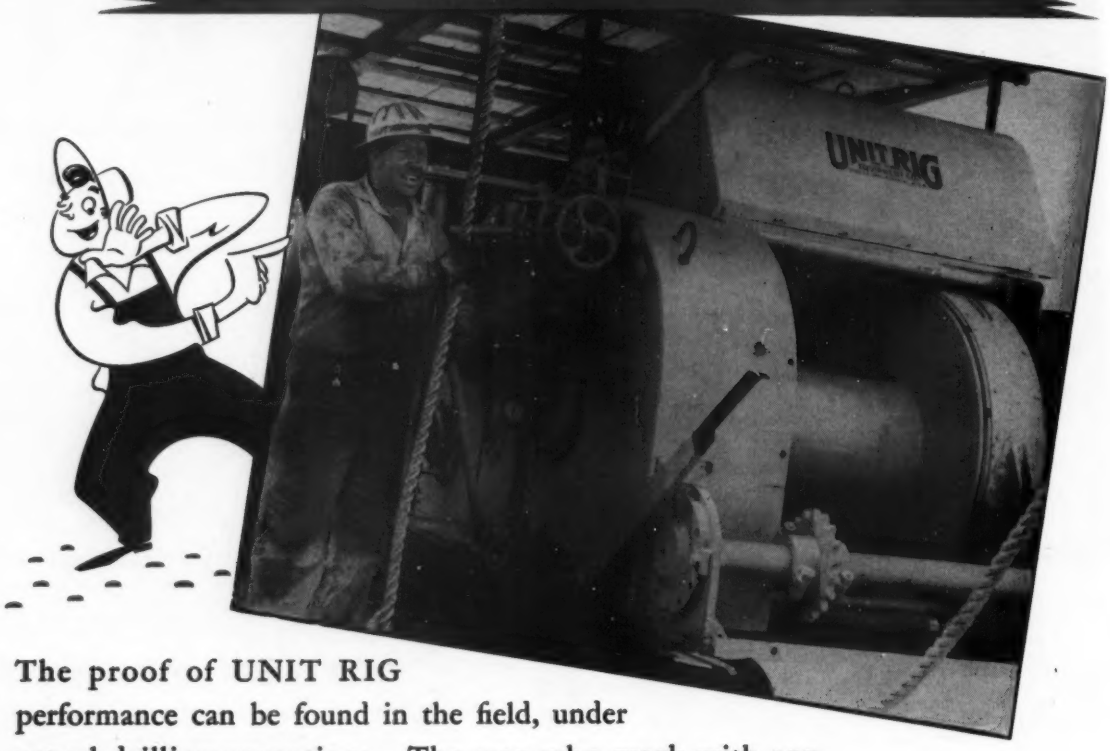

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PETROLEUM PUBLISHING COMPANY

211 S. CHEYENNE AVE., TULSA 1, OKLAHOMA

FOUNDED IN 1910 BY PATRICK C. BOYLE

Subscription rate to the petroleum industry, United States and foreign, 1 year, $3.00. Single copies, 20 cents. Back copies, when over a year old, 50 cents. Note: Payments from outside the U.S.A. may be in the form of an international money order or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879.

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Vol. 46, No. 42 February 19, 1948

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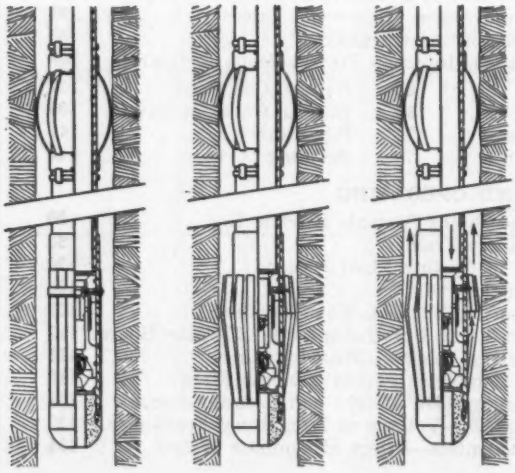
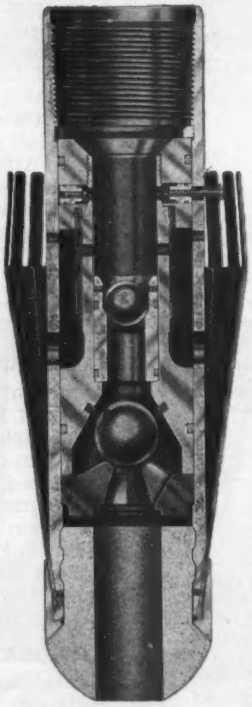
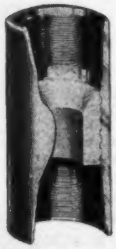


The Baker Triplex Cementing Shoe (left) in running-in position, centered in the hole by a Baker Casing Centralizer. In the center illustration the Tripping Ball has been dropped, seated, and the Tripping Valve forced downward. This action shears the shear screw holding the Metal Petal Basket against the Shoe, and permits the Metal Petal Basket to expand against the side walls of the hole. The ports are now open ready for cementing. At right, cementing is under way, with the slurry directed upward to completely encase the centered pipe with a uniformly thick body of cement with the expanded Basket retaining the cement above the Shoe.

The Baker Triplex Flapper Valve Float Collar (Product No. 134) may be run in place of the Triplex Baffle Collar when an additional float valve is desired. Note how it is designed to permit passage of the Tripping Ball, and how an ample flat surface is provided for "bumping" the cementing plug.

At right the Triplex Shoe is shown in running-in position, with the Metal Petal Basket held against the Shoe by the hold-down strap which is fastened by a shear screw.

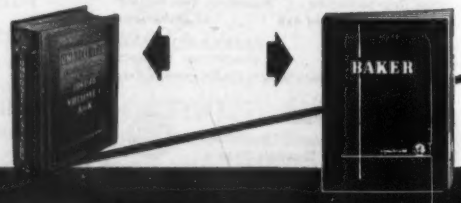




The Triplex Cement Baffle Collar (Product No. 137) is run a joint or two above the Shoe and serves as a stop for the cementing plug, so that mud-contaminated cement is retained inside of the casing. The hole is bevelled at its top to permit easy passage of the Tripping Ball.

(Left) The Tripping Ball has been dropped and seated on top of the Tripping Valve. Pressure of about 500 psi has sheared the shear screws and forced the Tripping Valve down to expose the cementing ports. Shearing the screws also permits the Metal Petal Basket to expand against the side walls and form a bridge which holds the cement slurry above the Triplex Shoe and protects permeable, low-pressure zones below from cement contamination.

Complete details are in the 1948 Baker Catalog — and THE COMPOSITE CATALOG



BAKER TRIPLEX CEMENTING EQUIPMENT

THE OIL AND GAS JOURNAL

Petroleum Commission

A BILL, long rumored in Washington, providing for control of petroleum operations by a federal commission, was introduced Monday in Congress. Direction of the oil industry by a commission for years has been an objective of those seeking the extension of government controls to all the major phases of our economic life. Additional current support has come from the fact that little enthusiasm has been manifested for President Truman's request for the wartime controls over prices and distribution. Incidentally, the President's attitude toward the oil industry was again indicated on Monday when he, overlooking the much higher price levels in other consumer products, criticized the present oil-price structure.

When the public through its Congress fails to approve plans for extending administrative powers, the next move invariably is to try and set up a new commission or delegate additional authority to an existing agency to do what the elected representatives refused to do.

The arguments presented many years ago in the establishment of the Interstate Commerce Commission and more recently the Federal Power Commission will be offered in support of a petroleum commission. It will be explained that there is no intent to restrict oil operations in any division.

As to what actually happens we have the plight of the railroads after years of ICC regulations. Federal controls hamstring management which is unable to cope effectively with the many problems incidental to serving a rapidly expanding economy. Present rail rates and services are proof that users have not benefited from federal controls.

The brief history of the Federal Power Commission is also typical. The commission soon felt that it needed more powers than originally given it by Congress. In this instance the Supreme Court came to the rescue of the commission and in a decision last year gave it more authority over production and transportation in rate making than the commission thought it had. At the moment the commission is divided as to whether it should exercise these powers, while a confused Congress does nothing in defining and restricting the activities of the commission.

With this and other background it should be apparent what will happen to the oil business if it should be placed under the control of a federal commission. With all its operating ramifications, commission control of oil activities would be as complex and impossible as would be the control of food production extending from the farm, through processing and transportation, to the hundreds of thousands of distributing facilities. It would be fatal in the search for new oil to which all other petroleum operations are subordinated. Consumers and producers alike must be alert to the dangers inherent in a federal petroleum commission.

PETROLEUM—A *PROGRESSIVE* INDUSTRY

House Gets Bill Calling for Close Regulation of Entire Oil Industry

by Bertram F. Linz

WASHINGTON.—Federal regulation of the petroleum industry is called for in a bill introduced in the House February 16 by Rep. John W. Heselton of Massachusetts, a member of the committee on interstate and foreign commerce which has been following the oil situation closely.

Heselton's legislation would set up a national petroleum commission of 11 members appointed for 7-year terms, which would take over all functions now possessed by any government agency with respect to the regulation of transportation or sale of petroleum and petroleum products, including natural gas.

The commission would have authority to prescribe "such prohibitions and requirements with respect to the production, refining, distribution and sale" of oil and oil products and natural gas as "it deems necessary for the protection of the national security and economy."

There appeared little likelihood that Heselton, a Republican, would be able to get action on his legislation in view of the adamant opposition of Republican leaders to the several requests President Truman has made for more powers to control industry. Oil industry representatives in Washington, nevertheless, expressed concern over the situation, which they said was not made easier by efforts to arouse public animosity against the industry.

Recommended Embargo on Exports

Heselton has been one of the leaders in the House interstate commerce committee in recommending a complete embargo on oil exports, and this week he released a telegram received from Assistant Secretary of Commerce David E. K. Bruce, reporting that the cut in quotas announced last week was based on new information secured regarding the requirements of foreign countries. "In view of known restrictions in the major consuming countries which limit use of petroleum products to highly essential uses and in view of further fact no limitation exists on uses of petroleum in United States for nonessential purposes, it is our conviction that we have already reduced total exports as far as is justified by the facts now available and that further reductions in supplies made available for export would affect adversely our relations with other countries, and accentuate serious economic conditions," Bruce declared.

Bruce said also it was not believed that further limitations on exports of motor fuels would add sufficiently to our supplies to make any material difference in the domestic supply, but the matter is under review.

Introduction of the Heselton bill is significant since it comes at a time when a number of Republican members of Congress have been threatening to give support to the President's program of price and allocation controls, particularly with respect to petroleum.

That threat, voiced by Heselton and supported by Congressman Joseph P. O'Hara of Minnesota climaxed a week marked by three developments:

The volume of appeals for oil to Congress and government agencies mounted to flood proportions, with something like 40 telegraphic requests a day reaching the White House from cold individuals.

A group of Florida officials charged that oil prices have been unduly inflated by an oil "monopoly."

Officers of Petrol Corp. told the committee they were unable to meet their commitments to the federal Government and some 60,000 customers because their supplies had been curtailed.

Reconstitution of the Petroleum Administration for War was suggested by O'Hara, and Democratic members of the committee egged the Republicans on with observations that there might be something to the charges of monopoly which are flying around.

Oil Major Campaign Issue

President Truman, meanwhile definitely made oil a major issue of the coming capital campaign, telling a large delegation of Florida members of Congress and city officials that the election to Congress of more Democrats is the best way to bring about a reduction in the high prices of oil of which they had complained.

The President's position was disclosed following the White House meeting by congressmen who accompanied the group, which previously had visited the Department of Justice with a petition protesting "scandalous, reckless, and high-handed" boosting of oil prices by a "monopoly" and later laid their complaints before the House interstate commerce committee.

The congressmen said the President pointed out that he had twice asked Congress for legislation authorizing the imposition of price controls and Congress had come through with nothing more than a plan for voluntary agreements.

The President, they stated, said he would ask the attorney general to study the possible antitrust phases of the Floridans' charges and would make another appeal for control authority, and later, at a press conference, Truman said the commodity-market break had not made the problem of inflation less important and his original 10-point program still was needed to cope with the situation.

Bill Intended as Challenge to Oil Industry, Heselton Says in Interview

WASHINGTON.—Legislation to set up a national petroleum commission which he introduced in Congress this week is designed as a challenge to the oil industry to come in and show what it has done and intends to do in the future to eliminate shortages of fuel oil and gasoline, Rep. John W. Heselton of Massachusetts told The Oil and Gas Journal.

Heselton admitted that the legislation is incomplete in that it merely gives the commission blanket authority, but explained the congressional legislative experts said it would take 30 days or more to write a complete measure, which would be based on Interstate Commerce Commission regulation of the railroads translated into terms of oil.

The Massachusetts congressman, now serving his second term in the House has made a deep study of the oil problem as a member of the interstate commerce committee, but his interest in the matter has been enhanced by the tough conditions experienced this winter in his own district, regarding which he has had hundreds of complaints and appeals.

Heselton's major complaint, reflecting communications from constituents and experience on the committee, is that the industry has not satisfactorily explained why it has been necessary to increase prices, nor has it, he said, come up with a frank com-

plete statement of what it has done, what it will do and what it can't do.

He has, at least up to now, no complaint of the industry's efforts to alleviate the situation, which he denominated a "magnificent job," and said he has been unable to substantiate charges that the major companies have taken advantage of the situation to attain monopoly status.

But, he said, there has been "too much oratory and too little results." No member of Congress or committee has the time to follow up the situation on a day-to-day basis, and if that is necessary it should be done by some agency such as the proposed commission.

However, he emphasized, if the industry comes up this week with satisfactory explanations of price increases, such matters as the export of kerosine to Tahiti and fuel oil to the Fiji Islands, and other "anomalies," he will be perfectly willing to drop his bill.

There is little chance that any action ever will be taken on the bill by Congress as a whole and it probably will not reach the floor of the House, since it is contrary to the Republican policy of opposition to government control of industry, but Heselton wants a complete showing by the industry and government and declares the stamp of government "security" has kept the industry from telling some of the details.

Output of Middle Distillates Sets Record; Stocks Reported at Safe Level

RECORD highs in the total production of middle distillates and in the percentage of these products obtained from a barrel of crude have resulted in maintaining stocks of heating oils at a safe level in spite of winter weather 32.7 per cent colder than last year in 10 representative cities of the East and Middle West.

Spurred by the unprecedented demand, refiners generally have been readjusting their operations to produce the greatest possible volume of distillates, including heating oils, diesel fuel, and gas oil. During recent weeks the yield of distillates has been creeping up, and in the week ended February 7 the national average reached a new record of 21.02 per cent of crude oil run, according to statistics of the American Petroleum Institute.

During this same week crude runs reached the very high total of 37,436,000 bbl. with the result that the output of distillates set a new record of 7,870,000 bbl. for the week. Kerosine yields during this week were 6.59 per cent, which is high but not a record; kerosine yields have been averaging above 6 per cent most of the winter.

Stocks of distillates have been declining in excess of 2,000,000 bbl. per week since January 1, but the rate of decline has lessened in the two most recent weeks recorded. On February 7 the total stock figure for the nation was 38,538,000 bbl., not counting supplies in the hands of consumers and retail distributors. If the drain on stocks during the balance of the month can be held to the level of the week ended February 7—2,042,000 bbl.—the supply probably will be sufficient to last out the remaining 6 weeks of the so-called normal heating season without reducing them below minimum working levels.

National averages, however, are little comfort when local tanks run dry. Stocks of distillate fuels at refineries and bulk terminals in Texas Gulf, Louisiana Gulf, and East Coast districts at the end of January were only 17,702,000 bbl., which is 11,658,000 bbl. less than stocks in these districts on January 31, 1947. These three districts supply most of the heating oils used in the northeastern part of the country which has been hardest hit by the winter weather.

In all other parts of the country distillate stocks were 22,878,000 bbl. on January 31, or 4,041,000 bbl. more than a year previously, thus emphasizing the industry's explanation that the chief reason for local shortages is lack of sufficient transportation facilities to distribute supplies.

Foster Sells Properties To Arkansas Group

Tobe Foster, Lubbock, Tex., oil operator, and associates, have sold 46 producing oil wells and undeveloped acreage in Mitchell, Howard, Dawson, and Andrews counties to Louis Cherry and others, of Little Rock, Ark. Consideration was said to be $3,000,000, part of which was to be paid in cash and the balance out of production.

I.O.W.U. Approves 30-Cent Wage Increase Request

Approval of a plan to request an increase of 30 cents an hour for the nation's 250,000 oil workers in 1948 has been voted by the wage-policy committee of the International Oil Workers Union.

Sun Not to Join in Industry Agreement

WASHINGTON.—Sun Oil Co. served notice this week it will not participate in any industry agreement under the Taft Antiinflation Act, although it will cooperate with approved coordinators and commissions in the alleviation of hardship cases.

The company's position was disclosed by Robert G. Dunlop, president, in the course of testimony February 17 before the House interstate commerce committee as it opened a probe of oil prices.

He explained it was based on the fact sufficient time has not elapsed since enactment of the law "to permit a considered opinion as to the effect on the competitive position of the smaller refiners and dealers in the industry resulting from any program adopted," and said Sun does not intend to enter into any agreements regarding the "allocation, rationing or distribution of supplies."

Dunlop came to Washington to testify on this winter's price increases, which he admitted resulted from Sun's action last November in increasing its offering for crude by 50 cents a barrel.

Dunlop emphasized that the price increases made during 1947 resulted in attracting large additional quantities of oil to the market, January production being 543,550 bbl. greater than immediately before the first advance last March.

Commenting on the lag in oil prices behind the general price pattern, he told the committee "the practicalities of the situation require price increases, not only to stimulate more production but also, and just as important, to check the expansion of a demand for fuel oils that has been growing out of all bounds."

House Asks for All Data On Supply of Products

WASHINGTON.—A resolution calling on the secretary of interior to furnish Congress with full information concerning the amount of fuel oil, gasoline, petroleum products and coal now available in the United States and "what steps the Government should take to make the proper and necessary supply available," was adopted by the House, February 16.

The measure was sponsored by Edith Nourse Rogers of Massachusetts, who charged that government officials questioned by committees regarding supplies and exports have "shadow-boxed" and failed to provide intelligible information.

Texas Officials Take Steps Toward State-Supported Research Program

by Dahl M. Duff

FIRST definite steps in setting up a state-supported program of petroleum research in Texas, designed primarily for improving oil recovery, are being taken by officials representing the Railroad Commission and the state's two major educational institutions.

Gov. Beauford Jester already has endorsed the plans. The board of directors of Texas A. & M. College set aside $50,000 initially for the work, and Texas University regents January 24 approved an appropriation of the same amount.

At the present time there are varying opinions among the various officials as to the scope of the program and the exact method of operation. These differing ideas are expected to be resolved eventually, and the result will be a petroleum research program "not unlike that in Pennsylvania," as one official described it.

A state-supported research program has been discussed at various times in recent months by members of the Railroad Commission. Last October Col. E. O. Thompson, chairman, in a talk at San Antonio, outlined a plan whereby a state appropriation of $120,000 annually would be used to pay 50 graduate engineers working on fellowships at the university and at A. & M. Funds for this would come from the ⅛ cent a barrel tax on Texas production now levied for the support of the regulatory agency and only about a third of which is now used by the commission.

Murray Stresses Need

Another commissioner, W. J. Murray, Jr., in a talk last fall in Houston, declared there is an urgent need for a vastly expanded research program. While the research of some companies is to be praised, Murray said he did not believe that the industry as a whole is carrying on nearly enough research and that it is not adequately correlated to obtain most benefits of the work done. The third commissioner, Olin Curberson, also has spoken in favor of more conservation research.

The program envisioned by Thompson in his San Antonio talk is largely dependent on action of the state legislature in providing funds a year and a half hence. The plans which were initiated at the meeting last week are intended to fill the interim period and lay the groundwork for whatever program the legislature authorizes.

The resolution passed by the A. & M. directors proposed a joint committee representing the two schools and the commission to be known as the Texas Petroleum Research Committee. This group would assign specific problems to each school to avoid duplication and overlap of work. Emphasis would be on secondary recovery and improvement of primary-recovery techniques. The committee would consist of one commissioner, and the head and one member of the petroleum-engineering faculty of each school.

The over-all plans, though generally approved, are still in the formulative stage, and the degree of correlation of research between the two schools remain to be worked out. Equipment must be purchased and staff members added, either for the research itself or to relieve the present faculty for the program.

Facts Sorely Needed

Murray in his Houston talk declared the state is "woefully lacking" in the field of research by the universities. He pointed out that Texas derives 52 per cent of its taxes from the petroleum industry. Hard-boiled engineering facts, and not propaganda, he said, are needed to arouse public opinion to demand legislation of the type necessary to promote conservation.

A number of different research projects have been presented for possible investigation. One industry source suggested to Murray a general advisory engineering committee for the program and listed the following possible fields of study:

1. Studies of relative permeabilities of Texas oil reservoirs to oil, water, and gas.
2. Studies of displacement of oil in Texas fields by gas and by water.
3. Electrical-model investigations of the behavior and performance of Texas oil fields in which inefficient primary recovery is indicated.
4. Physical and chemical studies of relation between oil and water, and reservoir studies, including wetability of reservoir surfaces and possible methods of control.
5. Studies of well-completion techniques as they may affect subsequent injection of gas or water in oil-bearing strata.
6. Studies of the physical characteristics of Texas oil reservoir rocks with particular emphasis on pore size, shape, and distribution, and their relation to the retention of oil.
7. Studies of oil-production practices as it may affect ultimate recovery and possible secondary recovery in older fields.
8. Studies of residual oil saturation (a) after gas drive and (b) after water drive.
9. Accumulation of information on subsurface characteristics of Texas reservoir fluids.
10. Effect of corrosion on possible application of secondary recovery.
11. Studies of the selective injection of fluids into oil-bearing formations.
12. Studies of the action of explosives on underground formations and investigation of methods of increasing effective permeability by the use of explosives, acidization, etc.
13. Studies of the application of heat and solvents in secondary recovery.
14. Studies of the use of tracers in both primary and secondary recovery operations.

It was emphasized that the proposed fields of study listed above have only been suggested as one possible approach to the state program. The extent of the program that will emerge from the current discussions is still to be decided and it depends largely on support by the two schools and the legislature.

REPRINTS OF ANNUAL REVIEW AND FORECAST SECTION

A limited number of copies of a 32-page statistical section, which was part of the Journal's Annual Review and Forecast Number of January 29, 1948, are available. The price is 25 cents per copy.

We regret we are unable to supply the large number of requests for the entire issue of January 29. Orders for the statistical section should be sent to the circulation department, The Oil and Gas Journal, Box 1260, Tulsa 1, Okla.

State Leaders to Discuss Oil Problems in Meeting

Problems of the oil and gas industry will be the subject of a 2-day regional conference of the Council of State Governments in Oklahoma City February 20-21.

Governors, attorneys general, and legislators of Texas, Louisiana, Mississippi, Arkansas, Oklahoma, New Mexico, Colorado, and Kansas have been invited to participate.

this week

INTERNATIONAL—Russia's new cracking and hydroforming plant at Moosbierbaum in the Soviet zone of Austria is scheduled for completion early this summer. . . . 38 per cent of output is to be high-octane gasoline. . . . Total capacity estimated between 2,500 and 3,000 bbl. . . . ¶Navy Department expresses need for additional funds to continue Alaskan oil exploration. . . . $20,000,000 is needed to complete program, says W. G. Greenman, director of naval petroleum reserves. . . . ¶Palestine situation causes shift in Tapline field personnel from Syria and Lebanon. . . . Move to result in speeded-up operations on 875-mile Saudi Arabian section. . . . Completion date is not altered. . . . ¶M. G. Gamble tells A.I.M.E. members that larger and faster tankers will reduce transportation costs about 20 per cent. . . . ¶Saudi Arabian production for 1947 is reported at 89,851,646 bbl. . . .

LEGISLATION—Rep. John W. Heselton introduces bill calling for close regulation of all phases of entire oil industry, including natural gas. . . . ¶Congressman says bill is challenge to industry to "show what it has done and intends to do." . . .

TRENDS—Crude-oil production in the United States again sets new record with a daily average of 5,375,945 bbl. during week ended February 14. . . . Output is an increase of 6,840 bbl. daily over previous all-time high set a week earlier. . . . Mississippi leads producing states with gain of 6,700 bbl. daily. . . . ¶Runs to stills average 5,348,000 bbl. daily during week ended February 7, an increase of 14,000 bbl. daily over previous week. . . . ¶Well completions total 592 during week ended February 14, a gain of 9 over previous week. . . . Total includes 96 wildcats, a gain of 8 over previous week. . . . ¶Production of middle distillates reaches all-time high. . . . Stocks reported at safe level. . . .

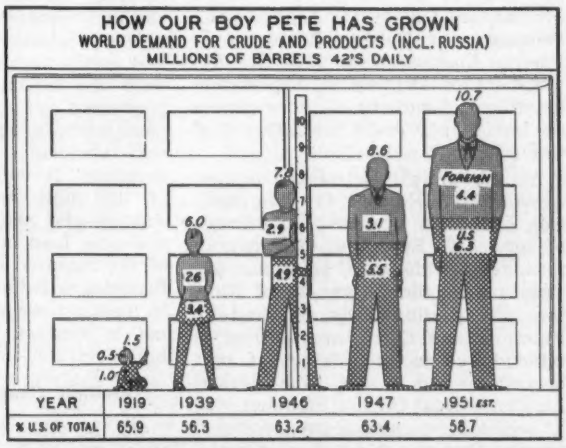
INDUSTRY—Russell B. Brown, I.P.A.A. counsel, attacks steel export quotas. . . . Says committee continuing study of domestic steel requirements. . . . ¶Pilot gas-injection project scheduled to begin operation this week in West Edmond field in Oklahoma, largest unit operation in nation. . . . ¶Standard Oil Co. of California abandons deepest well ever drilled in state at 17,696 ft. . . .

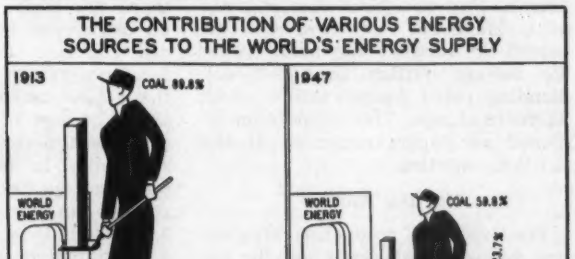
HEARINGS—Producers urge curb on powers of Federal Power Commission before Senate interstate commerce committee. . . . No break seen in deadlock of FPC members on proposals to amend Natural Gas Act. . . . ¶Final report on Arabian American Oil Co. investigation expected by end of February. . . . Report expected to contain mild criticism. . . .

PIPE LINE—Northwest Natural Gas Co. asks Federal Power Commission for authority to build United States sections of huge gas line from Alberta gas fields to Vancouver, B. C. . . . ¶East Tennessee Natural Gas Co. authorized by FPC to build natural-gas system to cost an estimated $11,500,000 to serve Chattanooga and Knoxville. . . . ¶Socony-Vacuum plans to start construction in May on Maine products line. . . .

NATURAL GAS—A "status determination" ruling by FPC holds La Gloria Corp. not a natural-gas company. . . . ¶Production of propane and butane to be increased in three Humble natural-gasoline plants in East Texas. . . . ¶1947 natural-gas sales increase 11.4 per cent. . . .

REFINING—Humble Oil & Refining Co. announces plans to spend $19,000,000 for new plant facilities. . . . Says Baytown refinery now exceeding design capacity by 25 per cent. . . . ¶Gulf Oil Corp. reveals long-range plan for construction of a refinery on Staten Island. . . . ¶Husky Refining Co. to increase capacity of Lloydminster, Alta., refinery. . . .





World demand for petroleum is shown graphically in these simple charts picturing the industry's growth and its relative contribution to the world's sources of energy. They were used by C. J. Bauer, Standard Oil Co. (N. J.) to illustrate his paper before the A.I.M.E. in New York this week, a summary of which begins on page 73 of this issue

Synthesis, Foreign and Domestic Oil Situation Get A.I.M.E. Attention

NEW YORK.—The outlook for synthetic fuels, current developments in oil production here and abroad, and the latest technical aids to exploration and production were among the many subjects discussed at the petroleum division of the American Institute of Mining and Metallurgical Engineers during the institute's 166th meeting here this week.

The world's oil picture, with a glimpse of the future, was sketched in a series of detailed reports on each oil-producing state in the United States and every foreign country which has indigenous crude oil resources. Among the featured papers in this part of the program were "Petroleum Transportation—With Special Reference to Tankers," by M. G. Gamble, head of the marine department of Standard Oil Co. (N. J.), and "Development of Natural Resources in Foreign Countries," by J. J. Brantly, president of Drilling & Exploration Co. (For a discussion of other papers on foreign petroleum see page 73 of this issue.)

At the annual petroleum dinner, February 17, Howard C. Pyle, division chairman, presented certificates of service to Eugene A. Stephenson, formerly a professor of petroleum engineering at the University of Kansas, and posthumously to Fred B. Plummer and Earl Oliver. Oliver is remembered as the "father of unit operation" and at one time worked for Continental Oil Co. Plummer was a well-known petroleum geologist. Charles Patton, a petroleum engineer with Magnolia Petroleum Co., received the Rossiter Raymond Award for having written the most outstanding paper by an author under 33 years of age. The competition included all papers presented at this A.I.M.E. meeting.

Not the Answer

The synthetic production of gasoline from natural gas is not the answer to the nation's long-range problem of insuring sufficient reserves of liquid fuels but it may point the way to their economical production from coal, the engineers were told in a paper on "Conversion of Coal to Oil and Gas," by Frank A. Howard, New York consultant and former president of Standard Oil Development Co.

Pointing out that the current interest in synthetic fuels stems largely from seasonal spot shortages and the present international situation,

F. A. HOWARD

H. G. DOLL

Howard expressed the view that neither would be aided by launching a large-scale construction program now, saying:

"The building of a synthetic-fuel industry does not seem to be the best solution of either the immediate shortage problem or the immediate military problem. It will be a slow and costly development as compared with the expansion of facilities for producing, refining, and transporting more crude oil and natural gas, and it will represent a worse drain on our economy. It will especially hit one of the most sensitive spots — steel supply—and actually it would place a double load on steel because most of the required expansion of present facilities will have to be carried out to meet processing needs, whether or not a synthetic industry is being built."

Predicts Continuation of Trend

On the other hand, he said, unless there are early and important new oil discoveries on the North American continent the present pressure for government support of a synthetic-fuel industry will not be relieved because of the long-range concern over permanent national self-sufficiency in the supply of liquid fuels and the forecast that war would require an increase in supply of 2,000,000 bbl. per day. He predicted a continuation of the recent trend toward use of liquid fuels in place of coal for most domestic and industrial purposes.

"It is difficult to escape the conclusion that solid fuels must be regarded as the nation's basic fuel reserve, and the liquid fuels as only the 'flush production' of fuel," Howard said, even though recoverable deposits of petroleum and natural gas "are probably great enough statistically to meet domestic demand for such fuels for at least two generations," since known coal reserves are 250 times those of liquid fuels when measured in energy values. Oil shales and tar sands, he said "will prove useful supplements but neither statistically nor economically do they seem now to rank with coals and lignites as the basic fuel resource."

Tracing the history of coal liquefaction down through American improvements on the German Fischer-Tropsch process for hydrocarbon synthesis, scheduled for early use in two plants to produce gasoline from natural gas, Howard said this process does not look like a direct attack on the conversion of coal to oil and gas and from the long-range standpoint it may really be going the wrong way because 40 per cent of the heat value of gas is lost in converting it to gasoline. He added:

"The point is, however, that the synthesis operation itself, that is, the conversion of water gas or synthesis gas into liquid products, is the same process and requires the same equipment and experience whether the synthesis gas be produced from coal or from natural gas. By converting natural gas into gasoline we are, therefore, piloting the conversion of coal itself into gasoline and natural-gas equivalent, and the only difference between the two operations is that we have yet to develop a more efficient method of coal gasification."

Practical Roads to Follow

The hydrocarbon synthesis process and the high-pressure hydrogenation process have each been shown to be practical roads which may be followed to convert coal into oil, Howard said, but comparing the two roads the gas synthesis process looks at this time the more attractive both from a commercial standpoint and a military standpoint because the capital cost and steel requirement have been estimated by some to be as much as 50 per cent lower.

H. G. Doll, director of research, Schlumberger Well Surveying Corp., Houston, in a technical presentation on electric logging showed the self-potential curve to be a measurement of the potential drop along the drill hole, caused by ohmic effect in the mud. He brought forward the notion of "static" self-potential, and its relation to the S.P. (self-potential) log.

The S.P. log, Doll said, although indicating permeability, is not an absolute measurement of permeability or of porosity of the formations traversed. It is affected by several parameters, such as resistivity of formations and mud, thickness of formations, and others, which should be appraised carefully. Doll outlined simple rules which have been established for a better distinction of the boundaries of permeable sections, particularly in difficult cases such as in highly resistive formations. A systematic application of the established

principles, he said, will assist in obtaining more information from the S.P. log than was possible thus far; for instance, under favorable conditions, presence of oil may be detected, or amount of shale in sands may be estimated. Title of Doll's paper was "The S.P. Log: Theoretical Analysis and Principles of Interpretation."

Two key terms in the business of cycling gas condensate reservoirs are "retrograde condensation" and "revaporization." The first term might be said why cycling should be done. The latter term is one possible factor on the other side (if there is an "other side")—as to why cycling should not be done. Thus the paper, "Revaporization of Retrograde Condensate from Sand," by C. F. Weinaug and J. C. Cordell, junior A.I.M.E. members from the University of Texas, dealt with a subject of both investment-dollar and engineering interest since behavior of hydrocarbons in the retrograde region is becoming increasingly important because a large percentage of reservoirs being discovered today are of the gas condensate type.

Most important characteristic of a gas condensate reservoir is the retrograde condensation of a liquid phase throughout the reservoir if the pressure is allowed to decline. To prevent the loss of this retrograde liquid in some of these reservoirs, they are "cycled;" that is, the material produced from the reservoir is processed to remove the heavier hydrocarbons and the light fractions are returned to the reservoir to maintain the reservoir pressure. Another method of producing these reservoirs is pressure depletion (there are other methods but they are not in general use).

Although there are a number of factors involved in determining the optimum method of producing a reservoir, Weinaug and Cordell considered only the problem of whether the retrograde condensate will revaporize from sand if the pressure is lowered sufficiently. Three types of tests were run, to compare the revaporization of retrograde condensate as formed in a cell with that formed in a *sand packed* cell, and to establish the effect of time. The test results indicated that both time and the presence of sand, insofar as they might enter the problem, promote the revaporization of the retrograde liquid.

New Tankers to Cut Transportation Costs 20 Per Cent, Gamble Tells A.I.M.E.

NEW YORK.—Explaining that "larger and faster tankers provide an answer to high operating costs," M. G. Gamble, head of the marine department of Standard Oil Co. (N.J.), told A.I.M.E. members this week that construction of a tanker larger than a T-2 indicates that transportation costs will be about 20 per cent less than in a T-2.

Gamble had reference to a tanker of a design of 26,000 tons, 16 knots, with a length of 628 ft. and a draft on summer freeboard of 31½ ft. "Although these vessels have a carrying capacity of 228,000 bbl. of light-gravity cargo," Gamble said, "their draft, being 1 ft. more than that of a T-2, will permit their entrance into the majority of ports, which can accommodate T-2s, with a full cargo."

At first, the Jersey Standard official stated, "we would expect tankers of this size to be used principally with fuel and crude oil, but with the present upward trends in the volume of petroleum products consumed, it is a safe assumption that as time goes on they will be used to an increasing extent for the transportation of light products."

Gamble stated that Jersey Standard has placed orders for four of these 26,000-ton tankers, which will have a total aggregate capacity of approximately 912,000 bbl.

While Gamble did not make the statement that these tankers would be used primarily in the Middle East and/or Venezuelan run, previous statements made by Jersey Standard officials, indicate that this is the plan.

Krug Seeks RFC Funds To Launch Synthetics

WASHINGTON.—Secretary of the Interior J. A. Krug this week disclosed a major plank in his plan to initiate a nine-billion dollar synthetic-fuels industry—that the three plants to be erected initially are to be constructed with funds secured from the Reconstruction Finance Corp. and operated by private companies under contract, in the same manner as the synthetic-rubber program was handled.

Before the House interstate commerce committee February 16, Krug repeated the statement he made a week earlier to the House public lands committee, bearing down heavily on the domestic supply situation and the uncertainty of the long supply line from the Middle East.

Krug proposed that three plants with a total capacity of approximately 30,000 bbl. daily be built for production from oil shale, hydrogenation of coal and gas synthesis of coal.

The Secretary disclaimed any desire to put the Interior Department into the oil business, telling the committee that its functions would be, as in the past, "the provision to American industry of a pattern of scientific, engineering, and economic 'know-how' obtained through research and development in the field of synthetic liquid fuels."

He pointed out that Defense Secretary James V. Forrestal had stated that the promotion of synthetic-liquid-fuel development is an important part of the petroleum policy of the military establishment, and declared the three proposed plants are needed not only as a defense measure but for our economic security.

Newton Named Head of District 3 NPC Group

WASHINGTON.—The National Petroleum Council last week set up the last of three committees authorized under the industry's voluntary agreement, to cooperate with the authorities in District III.

Appointment of the committee was announced by Chairman Walter S. Hallanan February 12, to be headed by John W. Newton, Magnolia Petroleum Co., Beaumont, Tex., and consist of the following members:

R. B. Anderson, Waggoner Estate, Vernon, Tex.; Robert O. Anderson, Malco Refineries, Inc., Roswell, N. M.; Hines H. Baker, Humble Oil & Refining Co., Corpus Christi; M. W. Boyer, Esso Standard Oil Co., Baton Rouge; J. M. Bradshaw, Hercules Oil Co., Dallas; C. M. Bryson, McMurrey Refining Co., Tyler, Tex.; Joe Hyer, Root Petroleum Co., Shreveport; Parker Kendall, Sinclair Refining Co., Houston; H. S. Lane, Crown Central Petroleum Corp., Houston; L. D. Mann, Cities Service Refining Corp., Lake Charles, La.; T. M. Martin, Lion Oil Co., El Dorado, Ark.; G. L. Rowsey, Taylor Refining Co., Taylor, Tex.; T. E. Swigart, Shell Pipe Line Corp., Houston; Raymond L. Tollett, Cosden Petroleum Corp., Big Spring Tex., and F. L. Wallace, The Texas Co., Port Arthur, Tex.

J. S. Dewar Purchases All Dewar Oil Co. Stock

All the stock of Dewar Oil Co., Bartlesville, Okla., has been sold to J. S. Dewar for an amount in excess of $200,000, according to Dudley C. Phillips, Dewar Oil Co. president.

International

WORLD-WIDE OIL DEVELOPMENTS

Personnel Shift to Speed Work on Saudi Arabian End of Tapline

WORK on the 875-mile Saudi Arabian section of the trans-Arabian pipe line is being speeded up as a result of Trans-Arabian Pipe Line Co.'s recent shift of field personnel from the north end of the line.

In his second progress report on Tapline, B. E. Hull, president, indicated the company's personnel have been transferred from Syria and Lebanon because of delays caused by disturbed conditions in Palestine and on its borders.

Delays on the Mediterranean end are not expected to alter the completion date of the 1,075-mile, 30-31-in. crude-oil line, set for 1950, Hull said.

A figure of 1,040 miles was given in the first report as the projected length of this line, but a minor route change within Saudi Arabia has since been made to provide for increased outlets from both the vast Abqaiq and Qatif fields, and also to provide a future outlet for Abu Hadriya and other prospective fields. Thus, 35 miles have been added to the overall length.

American Interests Secure

Back of the decision to speed up construction in Saudi Arabia, the Hull report stated, were the public assurances by King Ibn Saud that American oil interests within his kingdom would be protected, regardless of what happened elsewhere.

From other sources it is understood that the strong political influence of King Saud throughout the Arab nations probably will result in the necessary right-of-way through Syria, whose parliament is scheduled to meet about March 15. Just how soon the parliament will get around to considering approval of the right-of-way isn't known, but from many sources there appears to be every indication that approval will be given.

Meanwhile, stable conditions prevailing within Saudi Arabia are reflected in current field reports of steady progress in construction of the off-loading terminal at Ras el Misha'ab on the upper Persian Gulf coast, the report states. The field base camp at this point, designed to accommodate 600 Americans, is 80 per cent complete.

"Sea Island" Piling Almost Complete

The piling for the "sea island," a 400-ft. platform 2½ miles off shore, where incoming freighters will be discharged, is 90 per cent complete. Twenty-one of the 24 wooden towers which will support the aerial cableway from sea island to shore—the so-called "Skyhook" installation for quick handling of cargo—have been erected. The 1,600-ft., permanent causeway, at the end of which the "low-tide" lighter wharf will be constructed, is more than 75 per cent complete. Meanwhile, two temporary "high-tide" barge docks, one at the end of an 800-ft. earth fill and the other halfway along the permanent causeway, have served as barge landings for offloading of cargo from the 24 ships which had discharged at Ras el Mish'ab up to the end of January.

Before stringing, three to five 30-ft. lengths of pipe are being welded into 90-ft. to 150-ft. lengths. The Ras el Misha'ab pipe-jointing plant, where pipe will be welded automatically, already is in operation.

Along the pipe-line route, nine water wells ranging up to 1,200 ft. in depth are complete with pumping equipment installed. Five additional route water wells are close to completion.

The route survey was closed on January 19, with an error in spirit level closure of less than 20 ft. in more than 1,000 miles without intermediate check points.

(For details on Tapline's technical operations, see The Oil and Gas Journal, September 27, 1947, page 60).

U.S.S.R. Building Plant To Refine Austrian Crude

Construction of a new cracking and hydroforming plant at Moosbierbaum in the Soviet zone of Austria indicates that the Russians have no intentions of relaxing their claims to two-thirds of Austrian crude-oil production, according to reliable reports from Vienna.

Scheduled for completion early this summer, the plant reportedly will have a capacity of between 2,500 and 3,000 bbl. daily.

An estimated 38 per cent of the output will be high-octane gasoline. Some butane and propane also will be manufactured.

Part of the equipment for this new plant is said to have been taken from the French plant of Vacuum Oil Co. by the Nazis during the war. Some tubes and pipes were ordered from the Witkowitzer Iron Works in Czechoslovakia. The plant has been secretly under construction for the past 4 months.

It had been known previously that the Nazis built two hydroforming plants at Moosbierbaum with a combined daily output of approximately 3,500 bbl. It also had been known that the larger plant had been shipped to Russia.

Pemex Buys Three New Rigs in United States

Petroleos Mexicanos (Pemex) has just purchased three rotary rigs from Emsco Derrick & Equipment Co. as one step in the Pemex program to drill more wells this year.

In 1948 Pemex plans to export not less than 15,000,000 bbl., most of which will be to the United States, according to Antonio J. Bermudez, director general of Pemex. *(The Oil and Gas Journal, January 8, page 44).*

Colon Output Up

Venezuelan crude-oil production of Colon Development Co., Ltd., (Shell) for the 5 weeks ending February 2 totaled 403,488 bbl. (11,528 bbl. daily) compared with 334,524 bbl. (11,936 bbl. daily) for the 4-week period ending December 29, 1947.

A.I.M.E. Gets World Oil Reports; Told Middle East Essential to Recovery

by Warren W. Burns

NEW YORK.—The importance of Middle East petroleum to the world at large and particularly to European recovery and the success of the Marshall plan was emphasized this week at the annual meeting here of the American Institute of Mining and Metallurgical Engineers.

Among the many papers on exploration and production throughout the world presented at the section on petroleum economics, interest centered on those reporting conditions in Iran, Iraq, Saudi Arabia, and Egypt.

Outstanding was a discussion of "The Place Middle East Oil Will Occupy in World Markets," by C. J. Bauer of the coordination and economics department of Standard Oil Co. (N. J.).

Bauer, a recognized authority on foreign refinery operations, said that refinery runs and crude-oil production in areas outside the United States are expected to increase by an average of 400,000 bbl. daily in each of the next 4 years. This is a record, he explained, which has never before been achieved in the history of the petroleum industry.

Figures for the Eastern and Western Hemispheres combined show that world consumption outside of the United States in 1947 was 800,000 bbl. daily above the prewar peak of 1938, Bauer said. He estimated that by 1949 consumption will be climbing faster than the prewar trend and that it will reach 4,300,000 bbl. daily by 1951.

Russia Included in Discussion

In contrast with many previous discussions of the world oil situation, Bauer included Russia, stating that "the few pieces of information which are available indicate that the Russians are definitely short of supplies to meet their requirements." The damage, he said, "to the producing industry as result of invasion and excessive withdrawal rates over a long period of years have had their effect on crude-oil supplies."

As a result of Russia's rehabilitation work and drilling of additional wells in new areas, it has been estimated that "Russia was able to increase its output from below 400,000 bbl. daily at the end of the war to about 525,000 bbl. daily last year." This was about 100,000 bbl. daily below the estimated production in the years 1930-1940. Reparations and crude obtained by other means may have made up the 100,000-bbl. daily deficiency. Therefore, Russian demand in 1947 was limited to the available supplies of approximately 600,000 bbl. daily.

Russia's 5-year program calls for crude-oil output at about 700,000 bbl. daily by 1950. It appears then that Russian supplies will continue to dictate the pattern of the growth of demand.

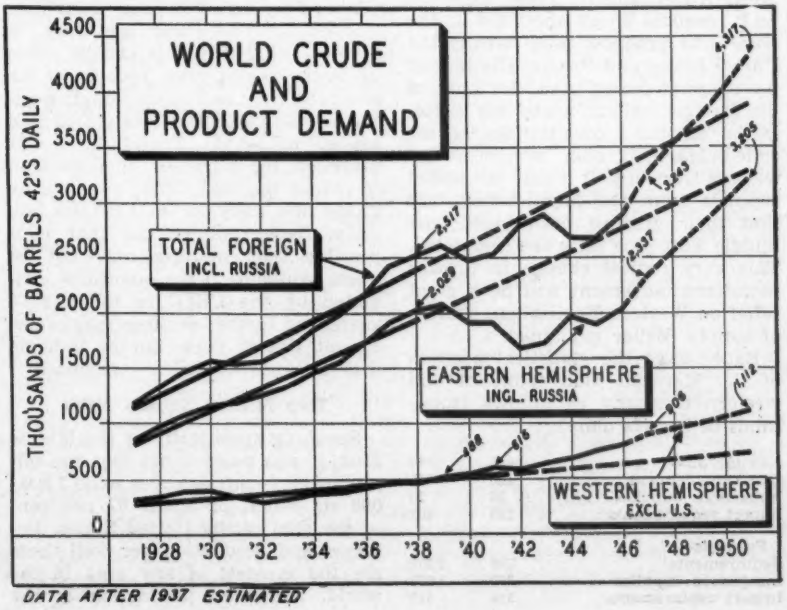
"Current propaganda is to the effect that every effort will be made to reach the 1950 oil target by 1949," Bauer said. "Apparently, uneconomic producing practices are beginning to be felt in the Soviet-controlled regions of Romania, Austria, and Hungary." These areas are no longer being regarded as sources for increased supplies—and understandably so, in view of the overproduction methods which the Russians are applying, regardless of efficient output practices. The prospects of finding crude oil in Soviet home territories were said to be unlimited, but state-controlled enterprises seem to lack oil-finding ability.

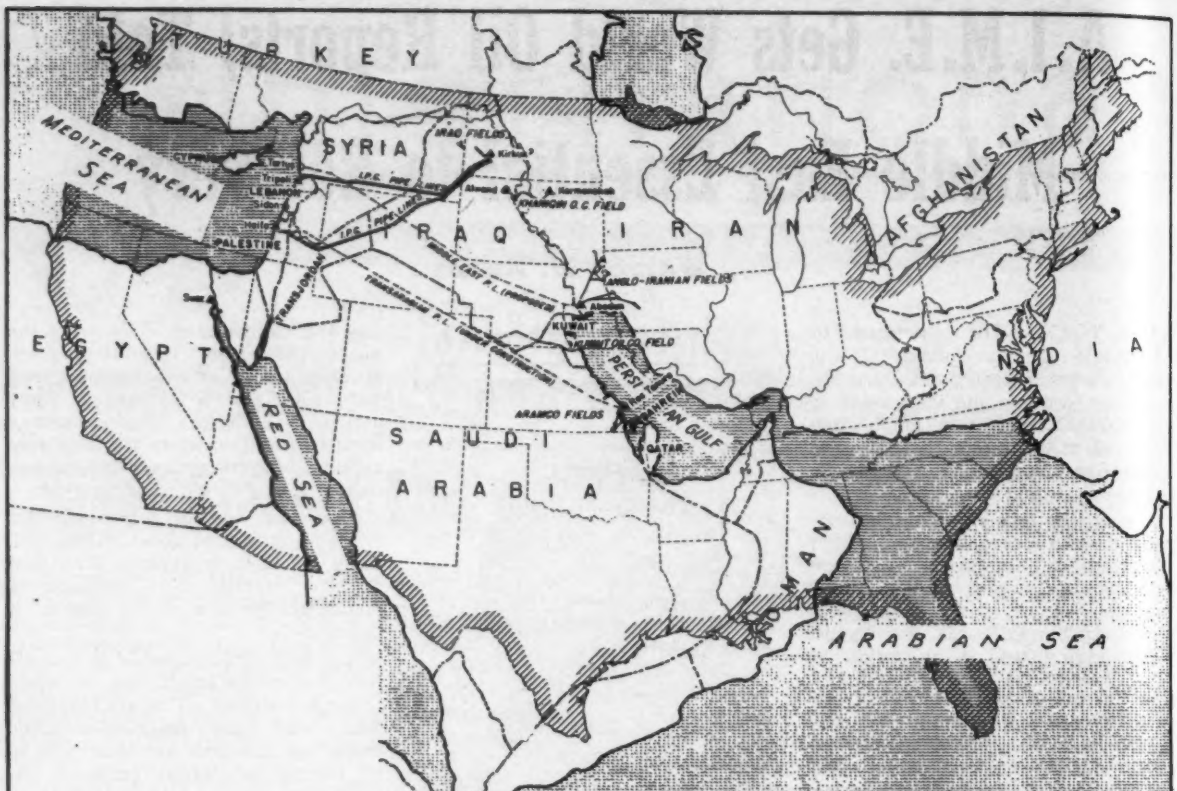
From the demand viewpoint, Bauer stated, the remaining part of the re-

International
WORLD-WIDE OIL DEVELOPMENTS

C. J. BAUER

C. J. Bauer, Standard Oil Co. (N. J.), featured speaker at the A.I.M.E. meeting. Map and chart with accompanying article are taken from Bauer's paper





A map of Saudi Arabia, superimposed upon the map of the United States, illustrates the comparative size of the Middle East production center and the lengths of the pipe lines necessary to move the crude from producing fields to tanker terminals on the Mediterranean

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gions abroad can be cut into three segments—Marshall plan countries, other Eastern Hemisphere, and other Western Hemisphere. These segments each consume about one-third of the crude and products used outside the United States and Russia. The largest petroleum-deficient area, not only of the foreign regions but of the world, is the one-third constituting the so-called Marshall plan countries and western Germany. It is here the added supplies from the Middle East will find their greatest outlet after the Middle East pipe lines are completed. This very radical change in prewar petroleum movement will be a great relief on Western Hemisphere sources of supply, Bauer explained.

Bauer gave the statistical position of the Marshall plan countries and western Germany as follows (thousands of barrels daily):

	1947	1951
Crude oil—		
Domestic demand	230	651
Indigenous supplies	35	50
Import requirements	195	601
Products—		
Requirements	792	1,291
Indigenous supplies	252	678
Import requirements	540	613
Crude and products—		
Requirements	792	1,291
Indigenous supplies	57	77
Import requirements	735	1,214

The local demand for crude oil and products in 1947 was estimated at 792,000 bbl. daily. This is about 82,000 bbl. daily less than the estimated requirements prepared by the CEEC (Committee of European Economic Cooperation) in Paris last July. It is doubtful if this drop can be made up in the next 4 years because of the generally tight petroleum-supply position of the world, the Jersey Standard official explained. Therefore, it was proposed for purposes of discussion to reduce the 1951 CEEC estimate by 82,000 bbl. daily, or to 1,291,000 bbl. daily. Bauer pointed out that it is possible that supplies may not be made available in the quantities estimated by the CEEC in the next 4 years, and further declines may occur. Recent reports from Europe indicate that this probability is recognized.

Two Million Square Miles

Speaking specifically of the Middle East, it was pointed out that the oil-producing countries cover some 2,000,000 sq. miles, or about 67 per cent of the area of the United States. Reserves and production per well there are the greatest of any area in the world. Moreover, production in the Middle East can be secured with minimum requirements for material and manpower, as compared with other world area.

Summarizing the Middle East oil situation, Bauer said:

"If the pipe lines are not completed, the estimated requirements previously discussed cannot be met. The success of the Marshall plan for the economic reconstruction of Europe will be jeopardized. Liberal allowances have been made for additional production for the other areas of the world. It is doubted if the production assigned other producing areas can be materially increased."

The Marshall plan countries will need about 600,000 bbl. daily of Middle East crude oil. This will take the greater part of the 760,000 bbl. daily exportable crude oil surplus in the Middle East in 1951. Some of the remaining 160,000 bbl. daily might be needed in the Western Hemisphere, Bauer observed.

The refined crude-oil production of the Middle East in 1951 is assumed to be 820,000 bbl. Approximately 200,000 bbl. daily will be needed within the area, thus leaving an exportable surplus of 620,000 bbl. daily. More than 300,000 bbl. daily of this has been shown to be needed in the Marshall plan area. The balance, therefore, Bauer said, probably will be

CRUDE PRODUCTION IN IRAN

	1946		1947*	
	Long tons	Barrels†	Long tons‡	Barrels§
Masjid-i-Sulaiman¶	3,674,797	28,356,300	2,684,000	21,170,000
Haft Kel	8,750,448	67,585,300	8,887,000	68,620,000
Naft Safid	699,389	5,298,900	652,000	4,940,000
Agha Jari	4,065,739	30,668,300	6,021,000	45,490,000
Paganum‖	27,370	242,800	.....	.....
Gach Saran	1,879,096	13,983,000	1,761,000	13,096,000
Naft-i-Shah¶	92,712	754,100	130,000	1,050,000
Total	19,189,551	146,888,700	20,135,000	154,360,000

*Actual to end of October—estimated for November and December. †To nearest 100 bbl. ‡To nearest 1,000 tons. §To nearest 10,000 bbl. ¶Net production; i.e., excluding recycled products. ‖Condensate production.

shipped into the other areas of the Eastern Hemisphere to satisfy the shortage of supplies in that general region.

Saudi Arabian production for 1947 was 89,851,645 bbl., or about 246,171 bbl. daily, according to James Terry Duce, vice president of Arabian American Oil Co. Of this, 34,816,451 bbl. came from Damman; 53,659,716 bbl. from Abqaiq, and 1,375,479 bbl. from Qatif. One well was completed at Damman, 17 at Abqaiq and one at Qatif. One well was abandoned at Qatif. At Buqqa, three wells were completed, but none are producing. No pipe line exists to Buqqa. This field is now believed to be the northward extension of Abqaiq field. If so, this field would be about 24 miles long and have an area of 85,000 acres.

Moreover, the drilling of a well, which has not yet been completed, has revealed other horizons below the Abqaiq zone production. The extent of this production is not at present known.

At Bahrein, total 1947 production was 9,410,710 bbl., or about 25,700 bbl. daily. Six wells are completed and one well was being produced to a deeper horizon. The Bahrein refinery ran at approximately 135,000 bbl. daily.

Duce presented the other papers on Middle East oil production although he was not the author.

A summary of the field production in Iran, as prepared by B. R. Jackson, United States representative for Anglo-Iranian Oil Co., Ltd., is shown in the accompanying table.

At Masjid-i-Sulaiman, the Jackson report explained, no new wells were drilled last year, existing wells having been adequate for the maintenance of production and the recycling to the reservoir of products surplus to requirements.

Extension Proved

At Naft Safid (While Oil Springs), one additional producer was brought in. Drilling up of the field continues. At Abha-Jari, drilling continued throughout the year, with three new producers having been completed. An extension of productive conditions to the northwest has been proved.

At Pazanum the high-pressure gas field remained shut down. At Haft Kel there were no developments of special interest. No new wells were drilled at Gach Saran. This area has been on continuous production from three wells.

At Naft-i-Shah production continued to supply local market requirements in Northwest Iran. The policy of recycling surplus products to the reservoir has been continued. At Lali, the possibilities of increasing production here was confirmed by the completion, during 1947, of an additional well, which on test produced at the rate of 28,000 bbl. daily. Additional drilling is in progress.

Indications that Kuwait will rapidly take its place as a significant Middle East crude-oil producer is shown in the fact that the daily average production of Burgan field climbed to 62,000 bbl. in December. A total of 16,227,093 bbl. was produced in 1947, and as of December 31, 1947, the total cumulative Kuwait production was 22,253,900 bbl.

Spacing Changed

Production in Burgan field, according to a paper prepared for the A.I.M.E. by C. W. Hamilton, vice president in charge of foreign operations for Gulf Oil Corp. (50 per cent owner of Kuwait Oil Co., Ltd.), comes from three principal sand zones of Middle Cretaceous age with a total depth range in existing wells of 3,672 ft. to 4,750 ft. Oil gravities are 30°-31° A.P.I., and gas-oil ratios average about 500 cu. ft. per barrel. The early wells in Kuwait were drilled on about a 2-mile spacing but present drilling is being carried out on a triangular spacing grid giving about 200 acres drainage area per well.

Egypt, usually considered a part of the over-all Middle East oil picture, was reported on by O. A. Seager, formerly assistant production manager of Standard Oil Co. of Egypt and a director of the company, and El Sayed Fahmy Bey, Egyptian Government official. Production was 9,316,515 bbl. in 1947, they said, and of this total, 8,847,193 bbl. came from Ras Gharib; 350,954 bbl. from Hurghada; and 118,368 bbl. from recently discovered Sudr field on the Sinai Peninsula.

At Sudr, six wells have been drilled, five of which are oil producers with an initial daily production from 400 to 3,500 bbl. of 24.5° A.P.I. gravity crude oil. All production there is from basal Miocene and Upper Eocene limestone and sandstone, at depths ranging from 2,650 to 3,000 ft.

At Ras Gharib, six wells were completed as "fill in" locations and to the east, where Miocene limestones are productive under the Gulf of Suez. The main portion of this field produces from Cretaceous and Carboniferous "Nubian" sandstone.

At the close of 1947, as a sequel to exploring the flanks of the Hurghada structure (West Coast, Gulf of Suez, and Egypt's most southerly field), the second well of this program was testing at 950 bbl. daily from a depth of 2,525 ft.

In Egypt, throughout 1947, an experimental seismograph party was operated jointly by Egyptian Standard, Socony-Vacuum Oil Co., Inc., and Anglo-Egyptian Oil Fields, Ltd. In addition, Socony-Vacuum and Egyptian Standard had seismograph parties in the field, while Anglo-Egyptian had gravity-meter parties operating. All three companies had geological-mapping parties in the field.

As 1948 developments opened in Egypt, attention continued to be focused on the Gulf of Suez, where another discovery well at Asl was brought in (The Oil and Gas Journal, February 12, page 60). Extension drilling at Ras Gharib and Hurghada continues. Exploratory operations in the northwest desert (west of El Alamein) continue to be handicapped by the presence of untold numbers of land mines left by the Nazis and Allies when they were fighting in this region.

Baker Speaks

The highlights of Middle East developments, during 1947, of the Iraq Petroleum Co., Ltd., and its affiliates, were summed up in a paper prepared by Norval E. Baker, I.P.C.'s chief geologist. Baker said that a provisional estimate of I.P.C.'s 1947 production was 35,040,000 bbl. This compared with 33,453,000 bbl. in 1946. All crude came from Iraq's Kirkuk field.

I.P.C. had eight rigs in operation at the end of 1947, two on Kirkuk field, one each on Ain Zalah and Dukhan (Qatar) fields and four drilling in widely spaced unproved area. Eight wells were completed on the Kirkuk structure, with no dry holes. No increased pipe-line capacity was realized for I.P.C. last year, but if Palestine conditions permit the new 16-in. crude-oil line now being laid along the existing Haifa 12-in. crude

International

line will be completed in 1948. The new line will carry an additional 100,000 bbl. daily (approximately 5,000,000 tons annually).

Of the eight wells completed in Iraq's Kirkuk field, six were for eventual production when pipe-line capacity is increased and two were oil-water observation wells. Production was limited to about 90,000 bbl. daily and was derived from 10 flowing wells on the Baba dome. Two rigs were operated here throughout the year and, up to the end of October, had drilled approximately 17,367 ft.

Mosul Petroleum Co., an I.P.C. subsidiary, recommenced the development of the Ain Zalah field, some 50 miles northwest of Mosul. Well No. 7 was deepened some 633 ft. and at the end of the year was preparing to drill into the Upper Cretaceous producing zone at around 6,000 ft. Ain Zalah No. 9 was at a depth of 150 ft. at year's end. Geophysical work was conducted here.

On the Basrah concession, active geological and geophysical work enabled Basrah Petroleum Co., another I.P.C. subsidiary, to make two wildcat locations near the city of Basrah. The first is at Nahr Umr to the north and the second at Zubair to the southwest. Both are scheduled to spud in early this year.

The Petroleum Development Co., Ltd., (Qatar) resumed development operations in Dukhan field on the western margin of the peninsula. The two previous producing wells had been plugged and abandoned as a precautionary measure during the war. The third well had been abandoned in edge water on the east flank. Dukhan No. 4 had drilled around 5,000 ft. and was nearing the Zekrit producing limestone (equivalent to the Arab zone of Saudi Arabia) at the end of the year. This well is on the northern end of the structure. Geophysical crews in Qatar were busy during 1947.

Elsewhere, I.P.C. operations in 1947 were summed up by Baker as follows:

Trucial coast—Work consisted of running gravity meter surveys along the coastal strip marginal to the Persian Gulf.

Hadhramaut—A reconnaissance geological party started work late last year. The area is held under exploration permit by Petroleum Development (Hadhramaut), Ltd.

The Levant—Important exploration work was resumed over wide areas.

Syria—Syria Petroleum Co. spudded in two wildcats, at Baflioun, north of Aleppo, and at Bolaa in the Palmyra basin. At the close of the year, these wells were drilling at 4,700 ft. and 1,700 ft., respectively.

Lebanon—Lebanon Petroleum Co. started its Terbol wildcat on a big structure close to Tripoli. It was drilling at 4,300 ft. at the end of the year.

Cyprus—Geological and geophysical work was carried on by Petroleum Development Co. (Cyprus), Ltd.

Palestine — Palestine Development Co., Ltd., spudded in its 1 Huleiqat well near Gaza. At the end of 1947 it was still drilling at around 2,400 ft. A new location was in the course of preparation on the large Kurnub structure, which is located in the Negeb to the southeast.

Trans-Jordan—A concession covering the entire country was granted to Trans-Jordan Petroleum Co., Ltd. Geological work and some geophysics were carried on.

(A summary of the A.I.M.E. oil production papers on Europe and Latin America will be published by The Oil and Gas Journal, February 26.)

Aruba Refinery Claims New Processing Record

Lago Oil & Transport Co., Ltd., an affiliate of Standard Oil Co. (N.J.), processed an average of 380,484 bbl. of crude oil during December, a new record high for the second successive month at its Caribbean refinery at Aruba, Netherlands West Indies. Runs for November averaged 375,900 bbl. daily.

A new 1-day record for crude runs also was made during December, with a single day total of 434,750 bbl. This was an increase over the previous high for a single day's operation of 425,113 bbl. established in November.

Belgian Refinery Almost Back to Prewar Output

Daily refining capacity of the Raffinerie Belge de Petroles, the largest independent petroleum refinery in Belgium, has been rebuilt to practically its prewar output of 3,000 bbl. New units will be added in the future—as soon as United States equipment is obtainable.

The existing installations are built according to patents owned by Dr. Michael Melamid, managing director of Raffinerie Belge, who recently returned to Antwerp after a 4-month visit to the United States and Mexico. This refinery is run largely on heavy Mexican crude oil and manufactures mostly asphalt and fuel oil. After the war, Raffinerie Belge reportedly was the first customer of Arabian American Oil Co. for Middle East crude oil.

With the wartime destruction of Redeventza Ste. Ame. Belge, which had a daily capacity of 3,000 bbl., Raffinerie Belge became actually the largest such plant in Belgium.

Last year was the first postwar year which saw this Belgium refinery in full operation. The refinery suffered heavy war damage.

In the United States, Dr. Melamid is president of Melanol Corp., a company devoted largely to marketing operations in which his two sons, Alexander and George Melamid are associated.

New officers of the Houston chapter of Nomads are shown here following their inauguration at the chapter's recent annual dinner-dance. Front row, left to right, are Homer E. Thornhill, Thornhill-Craver Co., president; Furniss M. Prell, Hughes Tool Co., vice president; and Jack A. Barnes, Trinity Portland Cement Co., secretary-treasurer. Back row, left to right, are G. R. Winder, Well Equipment Manufacturing Co., assistant secretary-treasurer; W. H. Griffin, Baker Oil Tools, Inc., sergeant-at-arms; Ed M. Fontaine, National Tank Co., assistant sergeant-at-arms; Charles E. Richards, Gray Tool Co., regent; and C. L. Clausel, A-1 Bit & Tool Co., regent

Navy Asks Congress to Decide on Future of Alaskan Oil Search

WASHINGTON.—The Navy Department this week put squarely up to Congress the decision whether it is to continue its effort to discover commercially productive oil in Alaska or close the books on the exploratory program for which, so far, $1,800,000 has been appropriated.

If the work is to continue, Commodore W. G. Greenman, director of naval petroleum reserves, told a House armed services subcommittee February 16, Congress must be prepared to sink an additional $20,000,000 or more. A reasonable estimate of the cost of completing the program, according to Lewis W. MacNaughton of DeGolyer & MacNaughton in a letter to the committee, would be $25,000,000.

Greenman told the committee it is hoped that project can be continued until 1953, but the full estimated cost need not be appropriated now. The work is being planned for periods of 2 years, and it is proposed to ask appropriations for like periods. A supplemental appropriation of $1,000,000 will be required to carry the program through the fiscal year 1950, he said, due to the fact that the Navy has discontinued air transport and other services which would have saved that much under the original plan.

If the work is not to continue after June, 1950, he said, it will be necessary to modify plans to avoid waste, so it is essential to know now whether the program will be approved by Congress.

"It will serve no purpose as far as our program is concerned to support field work that cannot be followed by drilling because of ultimate lack of funds," he pointed out.

No Commercial Oil Yet

No commercial quantities of oil have yet been found, but one well has been completed which may be rated at 24 bbl. a day of extremely rich oil, Greenman said.

Suggestions by Greenman that the public lands outside the reserve might be opened to commercial development brought protests from subcommittee members that this would bring about another "Elk Hills," and he finally promised that before the Navy suggests such action to the Interior Department it will take the matter up with Congress. Several companies, he said, have evinced interest in the possibilities of Alaska and Standard (N.J.), Humble and Union Oil companies looked the field over last summer. Standard of California also has indicated interest, he added.

Pointing out that it is only a "hop, skip and jump" to Russia, Subcommittee Chairman Dewey Short of Missouri and some of the committeemen speculated that the Alaskan oil field would be "a pretty rich prize for someone to take" until Rep. Carl Vinson of Georgia terminated the discussion with a dry comment that they hadn't even found the oil yet.

In his letter, MacNaughton suggested that if oil is found in paying quantities it should be developed and transported to the United States and translated into underground reserves by exchange for reserves owned by companies in domestic fields strategically located, as for example, with Standard of California "in order to give the Navy complete ownership of the reserves in the Elk Hills field."

Greenman immediately challenged the latter suggestion, declaring the Navy department never has considered such a procedure since it already has complete control of Elk Hills production.

The subcommittee later this week will study the Elk Hills situation and the plan of the Navy to extend the boundaries of the reserve, and in his letter MacNaughton said that as a result of the readiness program adopted after the end of the war the field could produce some 100,000 bbl. daily in event of emergency.

MacNaughton recommended that the readiness program be continued, that the Stevens zone be further explored and fully developed, and that at least one test be drilled below the Stevens zone to check the possibilities of production from the Eocene.

Producers Ask Curb On Powers of FPC

WASHINGTON.—Spokesmen for oil and gas producers last week urged the Senate interstate commerce committee to curb the authority of the Federal Power Commission.

Appearing before the subcommittee headed by Sen. E. H. Moore of Oklahoma during the course of hearings on the Rizley-Moore bill to revise the Natural Gas Act, they testified that fear of the commission has been responsible for the refusal of many producers to sell to pipe-line companies, including many large oil companies who are fearful that, if they were brought under the law, their oil activities as well as gas operations might be controlled.

The subcommittee also sought unsuccessfully to get to the root of the two-to-two division in the FPC on the subject of modification of the law, but there appeared little likelihood of the commission reaching any agreement in the near future.

The question of natural gas also came before the House interstate and foreign commerce committee during the week, in hearings investigating the shortage of supplies in the Detroit area, with FPC officials explaining they were doing what they could to step up supplies, both in Detroit and in all other areas suffering from a scarcity of gas.

NEW STAFF ASSUMES PUBLIC RELATIONS JOB

Ralph Champlin, center, newly elected chairman of Oil Industry Information Committee, formerly known as the Public Relations Operating Committee, is shown here flanked by four vice chairmen of functional committees. They are, left to right, George Freyermuth, Standard Oil Co. (N. J.), general publicity; H. L. Curtis, Shell Oil Co., Inc., advertising; Conger Reynolds, Standard Oil Co. (Ind.), industry relations; and W. R. Huber, Gulf Oil Corp., supply-demand conservation program. Champlin, director of public relations for Ethyl Corp., succeeded Franklyn Waltman, Sun Oil Co., as chairman of the committee

WASHINGTON WATCHING

BY BERTRAM F. LINZ

Oil Stockpiles

WASHINGTON.—Now that Defense Secretary Forrestal has brought the matter out into the open, it appears that a number of people have been studying the possibilities of stockpiling oil as a hedge against the next war.

The military, it has been brought out, are studying the possibilities of importing oil and putting it into underground storage, preferably in some natural reservoir from which it could readily be withdrawn in case of need, by the House armed services committee, which touched on the matter in the course of the investigation of military supply it is now making, received some other suggestions also.

Ralph K. Davies, former deputy administrator of PAW, tossed out the idea that the oil might be stored in salt mines or limestone caverns.

E. DeGolyer, consulting geologist, suggested the more simple plan of purchase by the Government of a whole proven field and its capping until needed.

DeGolyer explained that the Government might make a trade, taking over a field of some 100,000,000 bbl. proved reserves with a 40,000 bbl. daily capacity and paying the owners in oil at the rate of 40,000 bbl. daily, preferably foreign oil. Coupled with this he suggested the elimination of the last vestiges of the import taxes on oil.

Proponents of stockpiling met with quick response from independent operators, whose mildest comment was that it is "impracticable" and charged the administration is magnifying the fuel-oil situation to pressure Congress into accepting ideas which in quieter times it would immediately reject.

School for Oil Men

THE Armed Forces Industrial College this year has embarked on a new program to give industrial executives in a half-dozen cities a condensed version of the regular course which it gives Army, Navy, and Air Force officers in Washington.

Officials of a number of oil companies are expected to take the course, which a traveling six-man "team" from the Industrial College already has given in New Orleans and Birmingham and will give in San Francisco, New York, Pittsburgh, and Chicago before the end of June.

In each of these cities, a committee of industrial executives nominates the business men who may take the course in company with National Guard and Reserve officers for whom it is primarily intended. Each course runs 2 weeks and consists of 40 lectures, so timed that business men need not abandon their offices for more than a few hours each day.

The Industrial College is concerned with study of the problems involved in mobilizing and administering the national economy for war, and its curriculum includes a course on petroleum which covers the oil supplies of the world and the problems involved in wartime fuel procurement together with the related political and other questions.

The condensed version of the course which is given in the field is believed to be adequate to furnish those attending with an understanding of the principles of economic mobilization, and the industry executives who participate are selected with care so as to embrace a cross-section of the personnel who may be expected to fill key positions in industry within the next 10 or 15 years.

The college was established in 1924 to train officers in the industrial aspects of war, to overcome the deficiencies which had become apparent during World War I. It was suspended at the end of 1941, but was reopened 2 years later to train officers in termination of war contracts and upon completion of that activity was converted to the training of officers of all the services in mobilization for war, economic warfare and the principles of procurement planning.

Tidelands Showdown

THE hearings on tidelands legislation which will open February 23 before a Senate judiciary subcommittee headed by Sen. E. H. Moore of Oklahoma are expected to develop a free-for-all showdown between advocates of federal ownership and supporters of states' rights, with the oil industry in the middle—a spot it seems now to occupy most of the time.

The subject of the hearings will be the legislation to return the California tidelands to the state and halt the administration's drive to take over the valuable underwater resources of all the coastal states, but Interior Secretary J. A. Krug and Attorney General Tom Clark are expected to make a fight for their suggested bill providing for federal leasing of the lands.

A number of individual measures to quiet the title of the states to their off-shore lands have been introduced, mostly by members from coastal states but some from inland districts. The scheduled subjects of hearing, however, will be S.J.R. 14, introduced at the opening of the 1947 session by Senators Moore, William F. Knowland of California and Pat McCarran of Nevada, and S. 1988, introduced last month by 20 members from Ohio, New Jersey, Nebraska, Florida, Pennsylvania, Massachusetts, Texas, Maryland, California, Virginia, Louisiana, Illinois, Kansas and Iowa.

The tidelands measure already has some legislative history. It was passed by Congress last year but vetoed by President Truman on the ground the Supreme Court should have an opportunity to act on the question of title before Congress took action.

Recently, a delegation headed by Sen. Tom Connally called at the White House to urge the President to withhold his decision until Congress sent him definite legislation, but later Krug and Clark conferred with Truman and apparently secured his support to the legislation providing for federal leases, which Krug sent to Congress this month.

Unsettled Question

SECRETARY OF THE INTERIOR KRUG is solemnly assuring Congress that his proposal to build a $9,000,000,000 synthetic fuels plant is not designed to put the Government in the oil business but merely to assist the industry in getting synthetic production under way. But the fact that Mr. Krug cannot bind his successors limits that promise to the very immediate future.

Currently, Congress is definitely opposed to putting the Government in business in competition with the oil or any other industry but, again, no Congress can bind a future one.

On this basis, it would appear that the question of who is to run the synthetic-fuels industry will not be settled for several years, possibly the full decade which Krug estimates will be required to get three big plants built and in operation, turning out thousands of barrels of oil a day from shale and coal.

A number of industry leaders already have expressed their views on the desirability of using the present temporary shortage of oil as the springboard for immediate start of an industry which they believe can best be developed by the oil industry itself over a period of time as price

and supply factors provide the necessary impetus.

Back of Krug are the military officials, who are primarily concerned with national security. Their natural desire is for a sure adequate supply of oil; they don't want to be dependent on Middle East oil as they once were on Far East rubber; so they provided the stimulus for the Krug plan.

So far, there appears to have been little consideration given the problems which must be solved if synthetic production is to be undertaken—the mining and moving of the millions of tons of coal that would be needed, the disposition of shale waste, and the manpower and other difficulties that would be involved.

That matter probably will come actively before Congress within the next few weeks, and Interior may be given funds with which to plan the project.

Falling Figures

SO many estimates have been issued on Europe's oil requirements under the Marshall Plan that probably nobody would hazard a guess today as to just what the actual figure finally will be. Some comfort, however, is to be derived from the fact that each succeeding revision brings it a little further down toward earth.

The Committee for European Economic Cooperation started out last year in Paris with a total of 273,591,000 metric tons of which 118,697,000 tons was to be dollar oil. The State Department started in immediately to juggle the figures, particularly after the Harriman committee, in what is probably the best of all the many reports prepared on the matter, pointed out that this country, in the first place, couldn't furnish all the steel Europe wanted to rehabilitate its industry and anyway had set its construction target entirely too high, and less oil than the CEEC estimated would therefore be necessary.

By the time President Truman submitted his program formally to Congress in December, the figure for dollar oil had shrunk to 107,915,000 tons.

But along about December, too, the supply situation in this country began to get tight, and by the time Congress convened last month the oil shortage had assumed the proportions of a major issue. So the State Department sharpened its pencils and started in anew, coming up this month with its latest estimate that Europe could get along with imports of 212,855,000 tons during the 4-year period, of which 94,525,000 tons would be dollar oil.

So far, accordingly, 24,172,000 tons of dollar oil has been squeezed out of CEEC estimates and 60,736,000 tons out of their over-all figure, but even these cuts do not satisfy members of Congress, particularly in view of admissions that in the event anything happens that interferes with the supply of oil from the Middle East a tremendous burden would fall on the United States.

Questioning whether the State Department even now is reckoning with the Middle East situation, Chairman Charles A. Wolverton of the House Interstate Commerce Committee last week called for minutely detailed information on the program.

Like many other members of Congress, Wolverton is skeptical of the department's reliance on foreign oil, and is determined the United States shall not be left holding the bag if unrest in Palestine boils into the Middle East producing areas, particularly at a time when this country is straining every resource to fill domestic requirements.

Brown Attacks Steel Export Quotas Set by Commerce Department

WASHINGTON.—Announcement by the Department of Commerce that steel export quotas for the current quarter include 40,000 tons of seamless and 68,335 tons of welded pipe lays the groundwork for an all-time record export of 433,000 tons this year, it was charged last week by Russell B. Brown, general counsel of the Independent Petroleum Association of America.

If the first-quarter quota is the pattern for succeeding periods, the 1948 exports will be approximately 100,000 tons greater than those of last year, Brown said, and the quota figures, he pointed out, do not cover the large quantities of materials set out in the Marshall Plan but not yet scheduled.

"This action by the Commerce Department is additional evidence of the persuasive power of the large oil companies operating on a world-wide basis," Brown declared.

"With industries in the United States shut down for lack of fuel and people suffering for want of heat, much of which could have been avoided by the use of this steel here at home, it does not seem to be good business judgment to use their influence to take steel away from the United States. The use of the material for the pipe line in Arabia will not add one barrel to the world supply but will only be a transportation convenience, not now but in 1951."

Meanwhile, the NPC committee which Brown heads is making considerable headway with its study of the steel needs of the industry which the Oil and Gas Division will present to the Commerce Department, and expects to have some figures ready around March 1. The committee's survey will cover the needs of the industry for both domestic and foreign operations.

Brown, who has broken his committee down into subcommittees, each covering one of the functional divisions of the industry, called the chairmen of those groups to Washington last week for an organization meeting, at which the scope of the work was discussed with OGD and Commerce Department officials.

Each of the subcommittees will ascertain as closely as possible the needs of its particular branch of the industry for steel during the life of the Taft anti-inflation act, which runs for 18 months, and the full committee then will compile the figures into a schedule on which the Commerce Department can discuss allocations with the steel industry.

The expansion program of the oil industry will not be involved in the voluntary agreement which it is to develop to replace the temporary agreement now in force, but will go into the steel industry agreement.

The figures which now are being compiled will be presented in terms of tons of steel in various forms required by each branch of the industry and for foreign operations, but will carry no reference to any specific projects, and the steel industry, it is contemplated, will be asked only to allocate a certain amount or proportion of its production to the oil industry and not required to earmark anything for particular companies.

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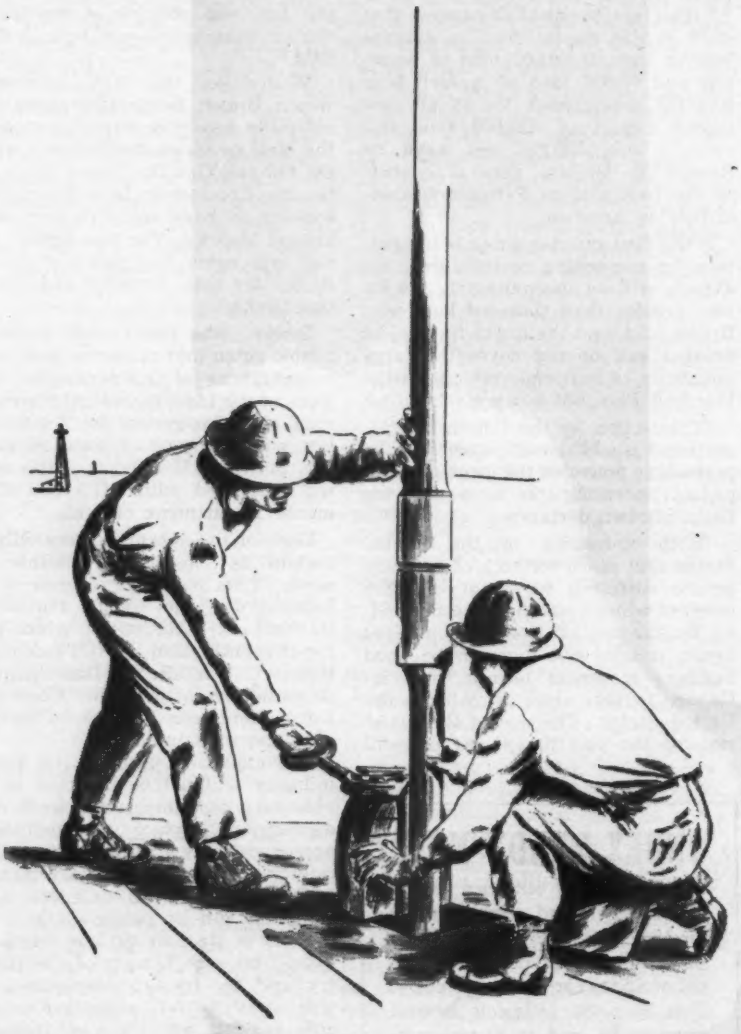

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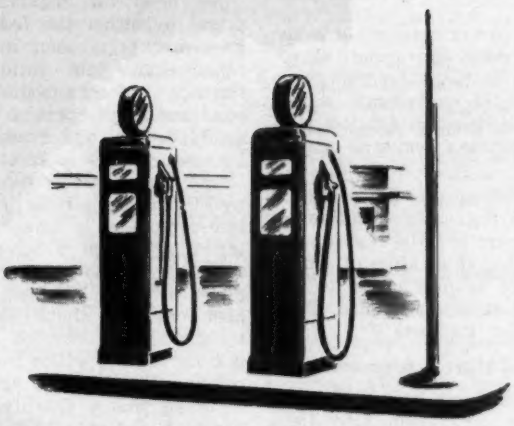
TO PUMP



From production to refining to marketing is never a short haul when time is considered. Today, with consumption of all petroleum products at a new high, it's important that this time from well to pump be held to a minimum.

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FPC Report Foresees Higher Gas Prices But No Regulation Needed

by Henry D. Ralph

THE price of natural gas is too low and the Natural Gas Act should be amended to permit pipe-line companies to use a fair field price or commodity value for gas produced by them instead of the public-utility rate base formula now used by the Federal Power Commission.

These conclusions, long held by the natural-gas industry, are now endorsed by two of the four Federal Power Commissioners, Chairman Nelson Lee Smith and Harrington Wimberly. They subscribed to the chapter "Field Prices for Natural Gas" in the series of staff reports in the FPC's natural-gas investigation, released this week. Publication of this report has been held up for months because of a deadlock among the commissioners.

Commissioners Leland Olds and Claude L. Draper are preparing a dissenting report. Ironically, the staff report was prepared by Burton N. Behling, director of the gas investigation, whose nomination as commissioner has been blocked by opposition of the oil and gas industry, though his confirmation would provide a majority supporting much of the industry's views on new legislation.

Will Help Legislation

Publication of this report, even without the endorsement of the full commission, should do much to speed passage of the Rizley-Moore bill, currently the subject of hearings before a Senate committee (see page 77). Although the report takes sharp issue with some provisions of this bill it supports its main objectives as to field prices for natural gas and points the way to compromises in its language.

Throughout the hearings in the FPC investigation and in testimony on the Rizley-Moore bill, industry spokesmen attacked the commission's method of fixing prices on gas produced by a pipe-line company or its affiliate. The commission has considered production and gathering part of the public-utility service and has valued the gas at 6 or 6½ per cent of the original cost, less depreciation, of these properties.

The FPC report now says that the investigation has revealed important defects in the cost standard as applied to gas production by regulated pipeline companies and their affiliates, and "it is concluded that a standard of fair field price or reasonable value, which would make appropriate allowance in each instance for the value of such gas as a commodity, should instead be adopted and applied, subject to appropriate safeguards against abuse."

In a reversal of the FPC attitude prevailing during early hearings on the Rizley-Moore bill, the report says: "The reasonable application of a field price standard is not unfair to the consumers of natural gas nor detrimental to their interests."

Will Not Hurt Consumers

The most striking feature of the report is the conclusion that field prices of natural gas are generally unsatisfactory to producers and public officials in the major producing states. Higher prices, it concludes, would be in the public interest because they would promote conservation in the field, stimulate exploration for both oil and gas, and improve utilization of gas by consumers.

"Higher field prices might be reflected to some extent in prices for gas in consuming markets," the report admits. "A substantial upward adjustment is possible, however, without a significant change in rates paid by customers generally. An average increase in field prices of 1 or 2 cents, for example, if passed on directly to all consumers, would amount to only a small percentage of the price paid for gas in consuming markets.

"But since prices of competing fuels, both oil and coal, have risen sharply in recent periods, it is probable in many situations that prices to industrial consumers of gas could be increased materially, without any corresponding change in rates to domestic consumers. Furthermore, to the extent that the earnings of a pipeline company on its regulated business were above a fair rate of return, a part or all of any increased field prices could be absorbed by such excess earnings."

The report vigorously denies industry charges that low field prices are due to the commission's regulatory methods, citing statistics showing that gas prices declined steadily from 1922 to 1940 and have risen slightly since, whereas FPC did not begin regulating field prices until 1940. It admits, however, that continued use of the cost basis of regulation might have a depressing effect on future field prices.

The prediction is made that field prices are due to increase further in the near future and that the buyer's market will disappear. The report strongly recommends that producing states enact ratable take laws to maintain equitable conditions in producing fields and centribute to the firming of prices.

No need for regulation of field prices by either the federal or state governments is seen in the report, other than state antidiscrimination statutes. It forecasts that competitive conditions will soon be sufficient to establish fair and reasonable prices for natural gas in most fields.

The cost formula heretofore used by FPC in fixing field prices for pipeline companies is condemned as placing this gas on a significantly different economic basis from gas produced by others. This method, the report concludes, should not be applied to a wasting resource and a risky mining venture which is not the usual public-utility type of operation.

Noting that a sharply divided Supreme Court permitted, but did not require, use of the utility formula, the report quotes with approval from the caustic dissent of Justice Jackson: "The service one renders to society in the gas business is measured by what he gets out of the ground, not by what he puts into it, and there is little more relation between the investment and the results than in a game of poker."

"As applied to current and future operations," the report says, "the cost standard has the basic infirmity of rewarding the inefficient or unfortunate producer and penalizing with a restricted return those who are more efficient or fortunate." It concluded that while to date the formula has depressed prices of gas produced by pipe-line companies, its continued use might well cause artificially inflated prices by including the costs of inefficient and unsuccessful wildcatting.

Divorcement Opposed

The report sees some substance in the threat that continued use of the cost formula might deprive interstate companies of sufficient gas reserves or cause them to divorce their producing properties. It does not approve of divorcement, seeing merit in the contention that the carriers can render better public service if they have some reserves of their own, and adds that if divorcement is desired it should be directed by Congress and not achieved indirectly through rate regulation.

In endorsing the idea of using a "field price" for valuing gas entering interstate commerce, the report points to many practical difficulties and criticizes the standard proposed

in the Rizley-Moore bill, but concludes that in most instances it can be ascertained by an averaging of various competitively determined contract prices for gas within and among fields in the general vicinity.

Some safeguard is needed to prevent rigging of prices in fields where there is no competition, the report says, and for this reason it says FPC should have power to review the reasonableness of the price of gas going into a regulated pipe line. This does not mean jurisdiction over production and gathering, it is emphasized. A general outline of legislation to achieve these objectives is included in the report.

Process Gas Undervalued

Another conclusion which coincides with industry views is that income from selling liquid products extracted from the gas at plants operated by pipe-line companies should not be included in the company's rate base. FPC has been including such profits, with the reesult that the processed gas has been valued at a negligible figure in some instances. Exclusion of extraction operations, the report says, will place all dry gas on the same basis whether processed by the pipe line company or before purchase by it.

Serious criticism is made of the provision in the Rizley-Moore bill permitting pipe-line companies to exercise an option of having their gas valued on the field-price method or the utility rate base formula. This was inserted because the cost formula gives a higher price in the older Appalachian fields. The report says this is unfair both to consumers and the companies. As an alternative to meet the problem it suggests FPC be given authority to supplement the field price by additional charges to meet special conditions, such as dwindling reserves or use of underground storage to supplement peak loads.

This option proposal had been ridiculed by opponents of the bill and a number of pipe line officials had expressed doubt that it would be practical. The report assumes FPC would take care of the Appalachian situation.

Aramco Investigation Report Ready by March

WASHINGTON.—Final report on the Aramco investigation is now being written by the Senate war investigating committee and is expected to be ready for release by the end of the month, when the committee winds up its work.

The report is expected to be somewhat critical of the company, but probably will not be very harsh.

It will deal with the charges that Arabian American Oil Co. overcharged the Navy on fuel oil because it made a contract at $1.05 a barrel in 1945 after having made a tentative offer at 40 cents a barrel in 1941 providing the Government would finance Ibn Saud.

California's Deepest Well Is Abandoned

The deepest oil well ever drilled in California has been abandoned. Standard Oil Co. of California's 1 Maxwell, near Ventura, was abandoned at 17,696 ft. when efforts to loosen stuck drill pipe failed. No. oil was found in any of the formations.

The previous depth record in California was 16,668 ft. in San Joaquin County.

Permit for Core-Drilling Platform in Gulf Asked

HOUSTON.—The South Texas Division of The Texas Co. producing department has made application to the Army Engineers at Galveston to drive test piling and erect a core-drilling platform in the Gulf of Mexico about 7 miles off High Island, Galveston County.

The operation will be conducted in water about 29 ft. deep at mean low tide.

Another application to the Army Engineers was made by Phillips Petroleum Co.'s Houston office. Phillips asked permission to construct a loading dock and dredge a 200 by 200-ft. turning basin in front of the dock in Copano Bay, about 7 miles north of Rockport, Aransas County.

FACE-LIFTING DUE EXPOSITION GROUNDS

An extensive face-lifting is due for the International Petroleum Exposition grounds in Tulsa between the time this photograph was taken and May 15, opening date of the 1948 exposition. Major buildings and areas in which new structures will be erected are numbered. They are: 1.—Hall of science. 2.—General offices and new international headquarters of Nomads. 3.—New four-room hospital. 4.—National Supply Co. building, now under construction. 5.—Site of new Bethlehem Supply Co. building. 6.—General Motors Corp. building. 7.—Chrysler Corp. site. 8.—Site of new Dresser Industries building. 9.—New "white way," already flanked by 43 new display booths. 10.—Coliseum where many educational features will be housed. 11.—Restaurant and cafeteria. 12.—Group of 25 new display booths. 13.—New Hughes Tool Co. building. 14.—Recently enlarged Jones & Laughlin building. 15.—Scientific and technical building. 16.—Area in which six display structures soon will be built

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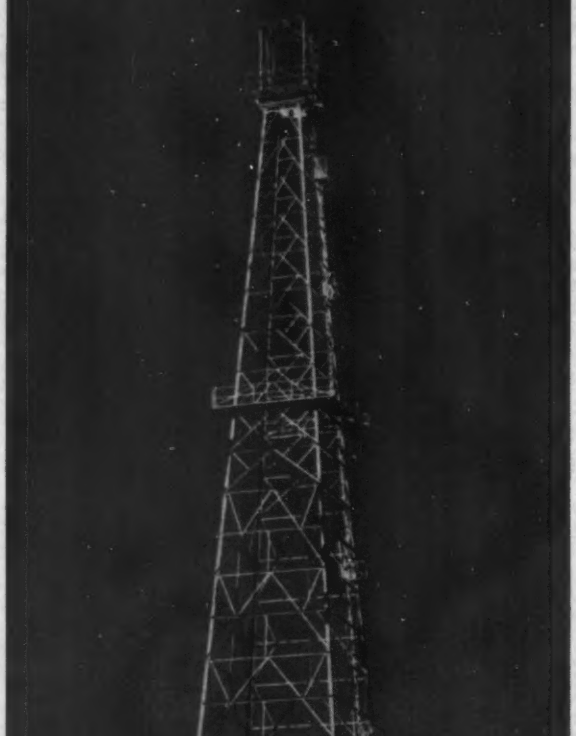
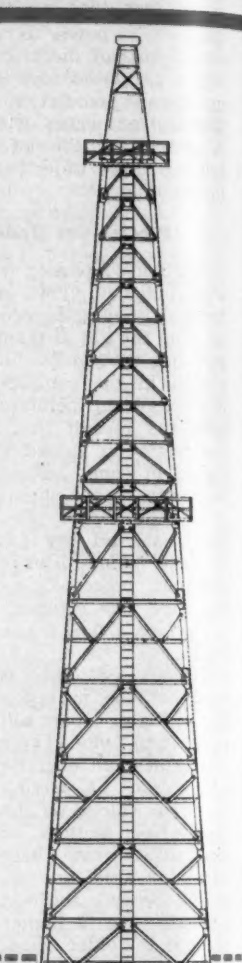
"KAY" Derrick, 140' with 30' A.P.I. base. Top opening adjustable from 5' 6" to 7' 6". Wind load capacity 125 m.p.h.





"KAY" Derrick, 189' co
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PERSONALS

Middle East Executive New Company Director

CHARLES L. HARDING, 42, newly elected a member of the board of directors of Socony-Vacuum Oil Co., Inc., is a former member of the company's law department. He has been coordinator of Middle East operations for the past 7 months and will continue to function in this capacity.

A native of Payson, Utah, Harding was graduated from the Utah Agricultural College with a B.S. degree and later was graduated from the University of California's School of Jurisprudence. He has been active in the petroleum industry since 1933, when he joined Shell Oil Co., Inc.'s, legal division in San Francisco.

Later he was transferred to Shell Union Oil Corp.'s New York office, and just before he joined the Petroleum Administration for War's legal division in World War II he was counsel in Shell's eastern marketing division.

At PAW, Harding was counsel for the so-called District 1 (16 East Coast states). For a short time during the war, following his PAW appointment, he was with Socony-Vacuum, later returning to PAW as the District 1 director-in-charge. At the termination of the war his Socony-Vacuum connections were resumed, at which time he became a senior attorney.

Harding is a member of the New York Bar and the Association of the Bar of the City of New York.

Isaac L. Ault, Magnolia Petroleum Co., has assumed the duties of assistant drilling tools superintendent of the company's marine operations in the Louisiana-Gulf area. Ault's headquarters will be Morgan City, La.

Lamar Lunt, consulting petroleum engineer, Midland, Tex., has been named vice president of the Permian Basin section, American Institute of Mining and Metallurgical Engineers. He succeeds **Joe Miller,** of The Texas Co., who recently was elected to the position but later was transferred to Fort Worth. **E. N. Spiars,** Spiars-Wells Equipment Co., was named chairman of the section's membership committee.

Paul C. Shea, former vice president and member of the board of directors of Carter Oil Co., has been appointed assistant to the general manager of the supply and transportation department of Esso Standard Oil Co. He has been with Standard since 1926. He joined Carter on a loan basis in 1945 as acting manager of the northwest division.

R. L. Bullock, engineer, corrosion section, Interstate Oil Pipe Line Co., became chairman of the Tulsa chapter of the National Association of Corrosion Engineers, February 13. **I. B. Tietze,** engineer, Phillips Petroleum Co., is vice chairman, and **F. M. Cloninger,** engineer, Texas Empire Pipe Line Co., is secretary-treasurer.

R. L. BULLOCK

T. J. Dwyer, Gulf Oil Corp., Fort Worth, has been named chief engineer of the production division, succeeding **R. L. Woodbury,** who has retired after 29 years with the Gulf company. **B. W. Miner** has been named assistant chief civil engineer.

Glenn L. Shoemaker, Stanolind Oil Purchasing Co., has been appointed representative in Lubbock, Tex. He will be in charge of the company's activities in that area.

J. H. Hall, manager of the marketing engineering department, Shell Oil Co., Inc., has assumed the duties of assistant manager of the operations department in addition to his present assignment.

M. R. M. Porter, field drilling superintendent of Burmah Oil Co., Ltd., is in the United States studying deep drilling methods preparatory to conducting deep tests in India.

E. H. Finch, on furlough from the Oil and Gas Division, Department of the Interior, is now associated with Beers & Heroy, Dallas, Tex.

Wheeler G. Lovell, formerly assistant head of the organic chemistry department of General Motors Research Laboratories, has joined Ethyl Corp. Research Laboratories at Detroit, Mich., as associate director of research in the basic combustion field.

James Lofton, drilling superintendent for Creole Petroleum Corp. at La Salina, is now in the United States to recruit drillers.

Mack Bell, of the drilling department of Iraq Petroleum Co., Ltd., is now vacationing in California. **Sam H. Dykes,** in the same department of the company, has returned to Tripoli after a visit to the United States.

Hobart LaMarr, superintendent of drilling for Burmah Oil Co., Ltd., has been in the United States and just returned to Burma. LaMarr formerly was with Standard-Vacuum Oil Co. at Sumatra.

M. B. Chittick, formerly manager of specialty and technical sales department, and prior to that assistant chief chemist for Pure Oil Co., has been made technical director and director of technical sales, for American Mineral Spirits Co., with headquarters in New York. **F. B. Loeffler,** formerly with Gulf Oil Corp. in Pittsburgh, has been made manager of the solvent department and will serve as assistant to the company's president, **E. M. Toby, Jr.**

Dr. J. V. Pennington, consulting engineer and a former vice president of Reed Roller Bit Co., has been named director of the Houston units of the Foundation of Applied Research and the Southwest Research Institute. He was a member of the faculty of Rice Institute from 1927 to 1933, teaching mechanical engineering and machine design. In 1946 and 1947, he was Houston advertising representative of The Oil and Gas Journal and Petroleo Interamericano. The two nonprofit research organizations for which he will be Houston director have headquarters in San Antonio. The foundation is planning the con-

PERSONALS

struction of a petroleum technology laboratory in Houston.

E. L. Green, Jr., executive assistant and head of the natural gas and gasoline department of Cabot Carbon Co., has been elected vice president of the company. Before joining Cabot in 1936 Green was with the Texas Railroad Commission as supervisor of the Panhandle and Gulf Coast districts. Prior to that time he was with Gulf Oil Corp.

Howard Quinlan, former manager of the producing department in Egypt for Socony-Vacuum Oil Co., Inc., has succeeded **C. Stuart Morgan** as a director and secretary of Near East Development Corp. Morgan has retired but is being retained as a consultant. Prior to being in Egypt, Quinlan was in Colombia as manager of Colombian Petroleum Co.

Ernest V. Moncrieff, formerly president of Swan-Finch Oil Corp., New York, has been elected chairman of the board. **Howard F. Moncrieff,** formerly vice president in charge of sales, has been elected president and chief executive officer.

H. S. Dischinger, superintendent of the east products pipe line of Shell Oil Co., Inc., has been named general superintendent of the company's products pipe line department in charge of operations. He will make his headquarters in New York. **J. F. Johnson** has succeeded him as acting superintendent of the east products pipe line.

R. T. Broughan, formerly associated with the Standard Oil Co. (N.J.) and Creole Petroleum Corp., has been elected vice president of Arabian American Oil Co. **George W. Ray, Jr.,** formerly of The Texas Co., has been elected general council of Arabian American. **R. S. Hatch,** formerly of The Texas Co. is manager of manufacturing for the company with headquarters in New York. **Dale Nix** is manager of production with offices at the general headquarters of the company in San Francisco.

John Dew has been appointed to the Aluminum Co. of America fellowship in the school of chemical engineering, University of Oklahoma. His research pertains to the study of the dehydration of natural gas with activated alumina.

William G. Heltzel, consulting engineer, has returned to Tulsa after 4 months in Brazil, where he has been serving as consultant in connection with pipe-line projects of the Brazilian Government.

Charles Moon, formerly technical advisor in the New York office of Socony-Vacuum Oil Co., Inc., has been transferred to the Socony-Vacuum Oil Co. of Venezuela as manager of operations in Venezuela.

Frank Champion has resigned as vice president and general manager of McCarthy Oil & Gas Corp. in Houston and is organizing Champion Oil & Gas Co. to conduct exploration and production operations. Before joining McCarthy 5 years ago, Champion was for 11 years vice president and general manager of Byron Jackson Co.

W. E. Adkins, technical director for the Alberta, Canada, government in charge of oil-sands development, returned last week to Canada following visits to Tulsa, Kansas City, and other points. The government's project in the Athabaska area for the recovery of oil from the sands is nearing completion and will be placed in operation in June.

Charles Wilkinson, formerly of the materials department of Cia. de Petroleo Shell de Colombia, in Bogota, has joined Drilling & Exploration Co., Inc., as chief of materials in the latter's operations in Turkey.

Robert L. Dean is now headquartered in Houston after spending 5 months in Morehead, Ky., where he was assistant engineer on the construction of Tennessee Gas Transmission Co.'s first electric turbo-blower compressor station.

Leland T. Jordan, district manager at Maracaibo, Venezuela, for Mene Grande Oil Co., C.A., has been appointed general manager in Kuwait for Kuwait Oil Co., Ltd. (Gulf Oil Corp. and Anglo Iranian Oil Co., Ltd.) He succeeds the late F. E. Patrick. Jordan graduated from Texas A. and M. College in 1929. He then joined the production department of Venezuela Gulf Oil Co. (now Mene Grande Oil Co.) and has served the company in various capacities in Venezuela since that time. **I. G. Davis,** formerly assistant manager at Maracaibo, has been named to succeed Jordan in Venezuela.

New officers and directors elected by North Texas Section, A.I.M.E. at the Fort Worth meeting February 2 include: seated, left to right: Dayton H. Clewell, Magnolia Petroleum Co., vice chairman for Dallas; R. E. Heithecker, Seaboard Oil Co. of Delaware, Dallas, secretary-treasurer; Warren J. Jackson, Lane Wells Co., Dallas, chairman; Ernest E. Merkt, Gulf Oil Corp., vice chairman for Fort Worth, and Tom E. Morton, Halliburton Oil Well Cementing Co., vice chairman for Wichita Falls. Standing, left to right, are newly elected directors: Edward B. Nicholson, Continental Oil Co., Wichita Falls; Eugene R. Brownscombe, Atlantic Refining Co., Dallas; Charles B. Carpenter, U. S. Bureau of Mines, Dallas, and Don L. Harlan, The Texas Co., Fort Worth. Not present was new director Ben M. Kingston, Chemical Process Co., Breckenridge

Carl E. Miller, formerly with the War Department in the Office of the Chief of Engineers as chief of the heating section and assistant chief of the utilities branch, has been named to the research advisory staff of the Battelle Institute, Columbus, Ohio, to act as a technical advisor on research in petroleum technology, gas and coal.

A. R. Brown, formerly assistant division engineer at Fort Worth for Stanolind Oil & Gas Co., has been named division engineer for the North Texas-New Mexico division. Brown graduated from the University of Texas as a mechanical engineer and joined Stanolind in 1935. **C. J. Christensen,** formerly district petroleum engineer for Stanolind at Casper, Wyo., has been named assistant division engineer for the North Texas-New Mexico area. He joined Stanolind in 1934 after graduating from the University of Nebraska as mechanical engineer.

A. K. Tyson, who resigned recently as southern region land department manager for Continental Oil Co. to become a vice president of Barber Asphalt Corp. with headquarters in Houston, has been elected a member of the board of directors of American Republics Corp. Barber has a substantial stock interest in American Republics.

Michel T. Halbouty, Houston consulting petroleum engineer, has provided funds for the establishment of a fellowship in geology at Texas A. & M. College. The award will pay $500 a year for advance study in geology. During the war Halbouty served as chief of the petroleum production section, planning division, in the Army-Navy Petroleum Board under the Joint Chiefs of Staff.

Frank W. Abrams, board chairman of Standard Oil Co. (N. J.), has received the honorary degree of doctor of engineering from the Rensselaer Polytechnic Institute, Troy, N. Y., where he was the commencement speaker recently.

SHIFTS—

Carl J. Christensen, engineer, Stanlind Oil & Gas Co., Casper, Wyo., to Fort Worth, Tex.; **M. C. Bates,** foreman, The Texas Co., Meridian, Miss., to Houma, La.; **John T. Ashford,** engineer, Associated Engineers, Inc., Midland to Houston; **M. B. Dickey,** foreman, Shell Pipe Line Corp., Livingston to Goose Creek, Tex.; **O. H. Berry,** engineer, Standard Oil Co. of Texas, LaPorte to Midland, Tex.; **J. L. Brown,** engineer, Shell Oil Co., Inc., Houston to Midland, Tex.; **O. I. Jantz,** foreman, Amerada Petroleum Corp., Crowley to Fayette, Miss.

Jack R. Fraser, engineer, Shell Oil Co., Inc., Wichita Falls to Great Bend, Kans.; **A. H. Ilfrey,** engineer, Humble Oil & Refining Co., Goose Creek to Houston; **H. D. Chrislip,** engineer, Deep Rock Oil Corp., Drumright to Tulsa; **John S. Cole,** engineer, Ethyl Corp., Casper, Wyo., to Salt Lake City, Utah; **William E. Lester,** engineer, The Texas Co., Abbeyville to Erath, La.; **John H. Larson,** engineer, Stanolind Oil & Gas Co., Wink to Midland, Tex.

William C. Kesner, foreman, Amerada Petroleum Corp., McCamey to Big Lake, Tex.; **L. D. Markham,** superintendent, Markham Drilling Co., Kilgore, Tex., to Shreveport, La.; **A. W. Lampadius,** chemist, Shell Oil Co., Inc., Tulsa to Houston; **L. E. Hazlett,** foreman, Stanolind Pipe Line Co., Marceline to La Plata, Mo.; **C. T. Rankin,** geologist, Amerada Petroleum Corp., Tulsa to Roswell, N. M.; **Robert J. Moffatt,** geologist, Carter Oil Co., Shreveport, La., to Jackson, Miss.

Castle J. C. Harvey, geologist, Atlantic Refining Co., West Jackson, Miss., to Tulsa; **D. M. Wilson,** engineer, Phillips Petroleum Co., Phillips to Shreveport, La.; **Frank Morrow Pool,** engineer, Humble Oil & Refining Co., Livingston to Genoa, Tex.; **D. K. Spellman, Jr.,** engineer, Ohio Oil Co., Iraan to Bay City, Tex. **E. A. Weichert,** superintendent, Gulf Oil Corp., Goldsmith to Odessa, Tex.

Nelson E. Trumbull, engineer, Matagorda Production Co., Bay City, Tex., to Bakersfield, Calif.; **Todd C. Storer,** engineer, Stanolind Oil & Gas Co., South Houston to Alvin, Tex.; **David C. Davis,** geologist, Pure Oil Co., Billings, Mont., to Kirtland, N. M.; **R. D. Woods,** geologist, Humble Oil & Refining Co., West Helena, Ark., to Houston, Tex.; **Gerald S. Williamson,** foreman, Continental Oil Co., Opelousas to Ville Platte, La.; **F. M. Stewart,** engineer, Stanolind Oil & Gas Co., Tulsa to Casper, Wyo.; **G. C. Merket,** geologist, Atlantic Oil & Refining Co., Shawnee, Okla., to Cisco, Tex.; **Glenn L. Shoemaker,** Stanolind Oil Purchasing Co., Midland to Lubbock, Tex.

Ford F. S. Blakeman, engineer, Southwestern Engineering Co., Long Beach to Lynnwood, Calif.; **Wayne Loel,** engineer, Burnoel Petroleum Co., Los Angeles, Calif., to Carson City, Nev.; **James S. Hopkins,** foreman, Amerada Petroleum Corp., Delano to Santa Barbara, Calif.; **T. S. Green,** geologist, Republic Exploration Co., Victoria to San Antonio, Tex.; **W. C. Guess,** foreman, Sun Oil Co., Cameron, La., to Beaumont, Tex.; **Harold E. Vaughan,** Continental Oil Co., Basile, La., to Rio Grande City, Tex.; **G. A. Schofield,** foreman, The Texas Co., Vernal, Utah, to Grand Junction, Colo.

DEATHS

Fred E. Cooper, 63, president of Fred E. Cooper, Inc., Tulsa, widely known manufacturer and distributor of oilfield equipment in the United States and foreign countries, was killed in a plane crash February 6 in the Gulf of Mexico, south of Brownsville, Tex. Cooper, who was a pioneer user of airplanes in petroleum operations, was flying his own plane to Venezuela and other South American countries when the accident occurred. His death was not known until February 14 when the body was found. Fred E. Cooper, Inc., of which Fred E. Cooper was president, is manufacturer and world-wide distributor of Allis-Chalmers well-servicing winch tractors and domestic distributor of Allis-Chalmers power units to the petroleum industry. He was active in several organizations. Cooper was one of the organizers and the first president of the Tulsa chapter of Nomads.

Benjamin F. Bart, 60, administrative executive in the southwest area for A. O. Smith Corp., died February 12 in Houston.

William A. Saner, 69, retired Oklahoma oil well driller, died February 15 in Tulsa.

Perry L. Chapman, 59, area superintendent for Stanolind Pipe Line Co., died February 14 in Lubbock, Tex.

John W. Pevey, 66, retired independent oil operator, died February 7 in Dallas.

William Bell, senior member of Bell Brothers, oil producers in Illinois and Oklahoma, died recently in Robinson, Ill. Bell was president of the Stripper Well Association.

Equipment

SHELL'S PORTABLE

MUCH interest has been displayed in a new Shell Oil Co., Inc., portable electric rig following a recent engineering description (December 20, 1947) by the Journal. In response to numerous requests, a picture story is presented here giving closeup views of much of the design and equipment featured by the rig, which is now on its second hole for Shell at Ventura, Calif.

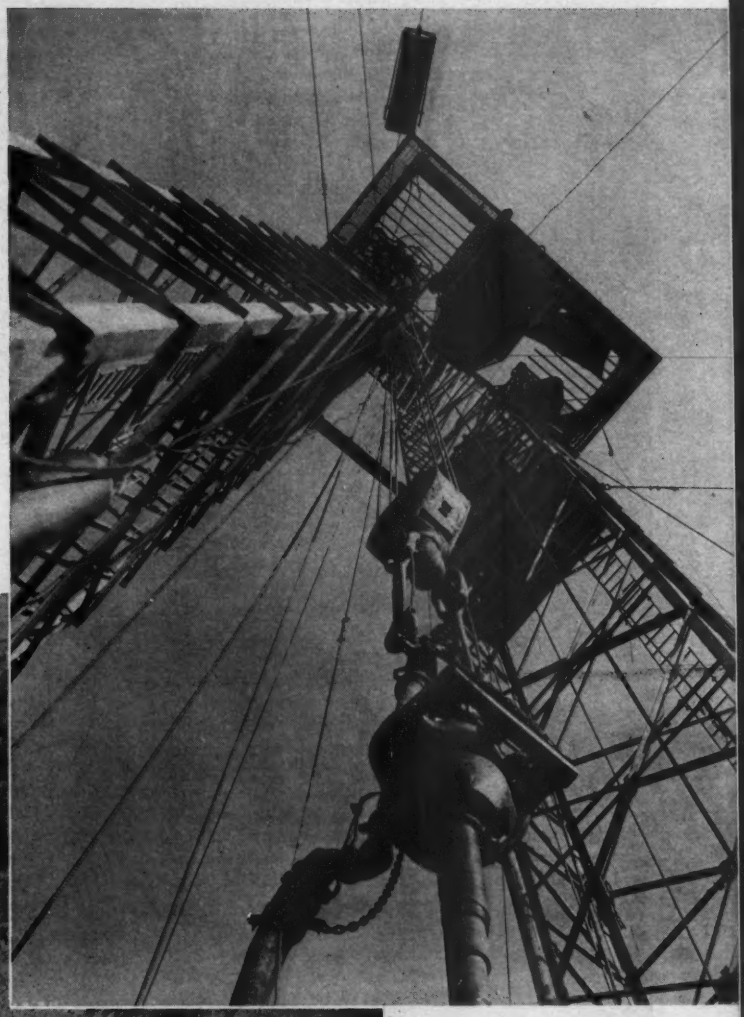
Above: Shell electric-rig derrick (designed by Waldrip Engineering Co., Los Angeles) is a fabricated A-frame type structure. Here it presents a unique appearance among the conventional derricks in the Ventura, California, field. Hook-load capacity is 300,000 lb.

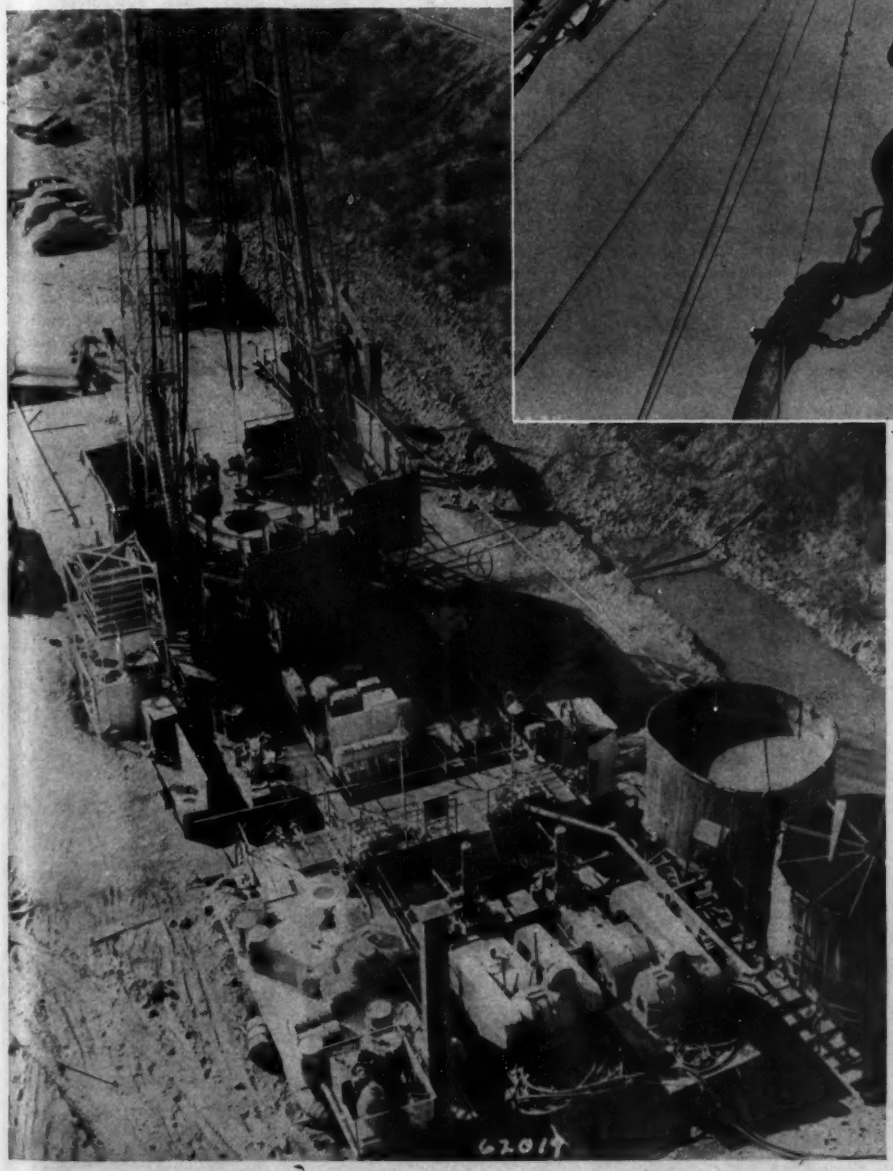
Below: At the "console," the driller operates the all-electric rig from his stationary pilot's seat. Instruments are so arranged that they may be viewed distinctly and rapidly

Details

ELECTRIC RIG

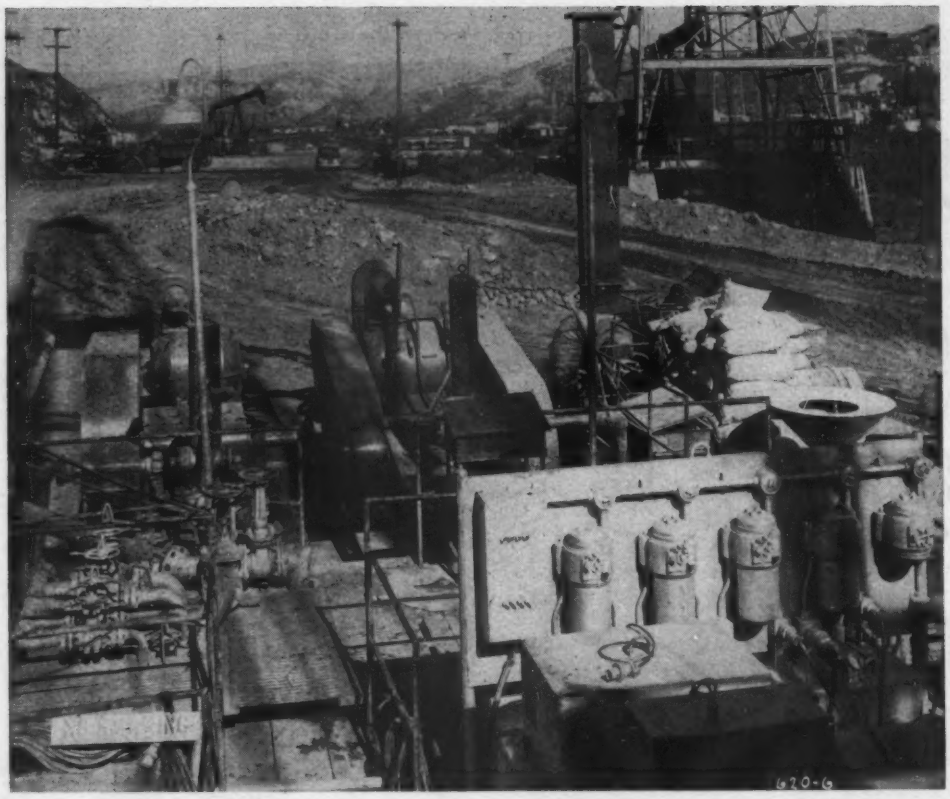
Subject: Photo study of one "big rig" design for meeting problems of 10,000-ft. wells, fast drilling, quick moves.





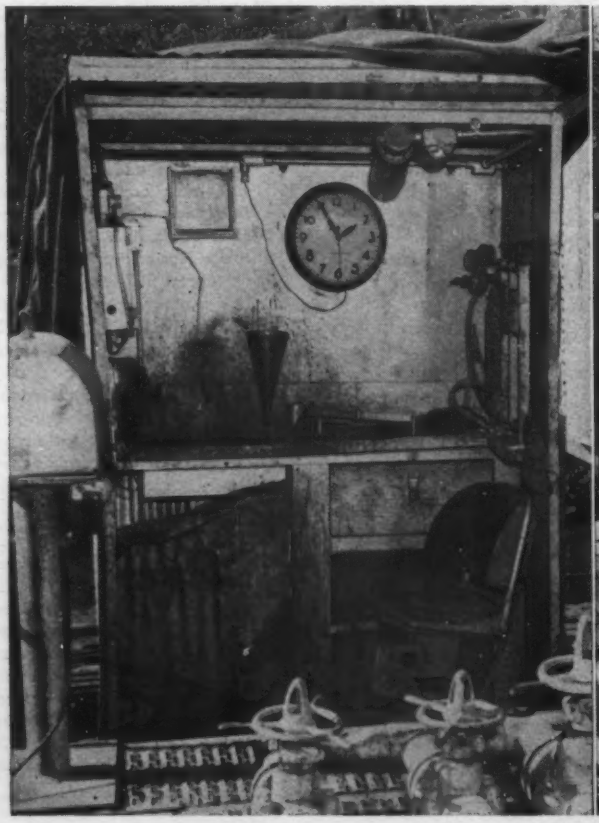
Above: Driller's view of tubing platform. This platform, the only piece added to the derrick after erection, is raised in a single piece with the traveling block. A 16-ft. spread between legs of derrick and edge of tubing platform gives derrick a rack capacity of 10,000 ft. of 4½-in. drill pipe. Drill pipe is stood at ground elevation rather than on derrick floor. This is accomplished by means of a special drill-pipe racking chute operated by remote-controlled hydraulic motors

Left: Shell uses a rig layout permitting efficient drilling operations and yet allowing the various units to be moved on and off location in minimum time. All units are permanently mounted on full or semitrailers, except derrick (moved as one piece); draw works (special loading equipment); and four-piece subbase (moved on a single semitrailer)

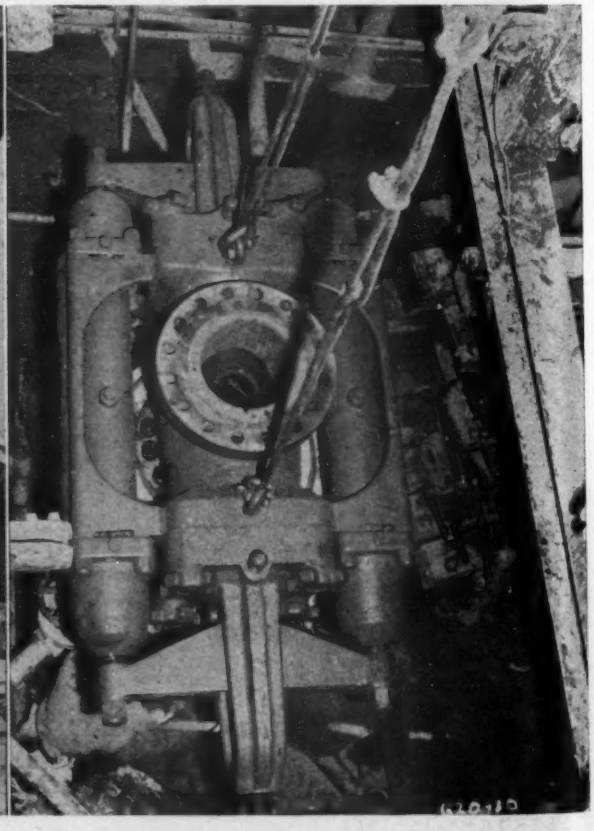


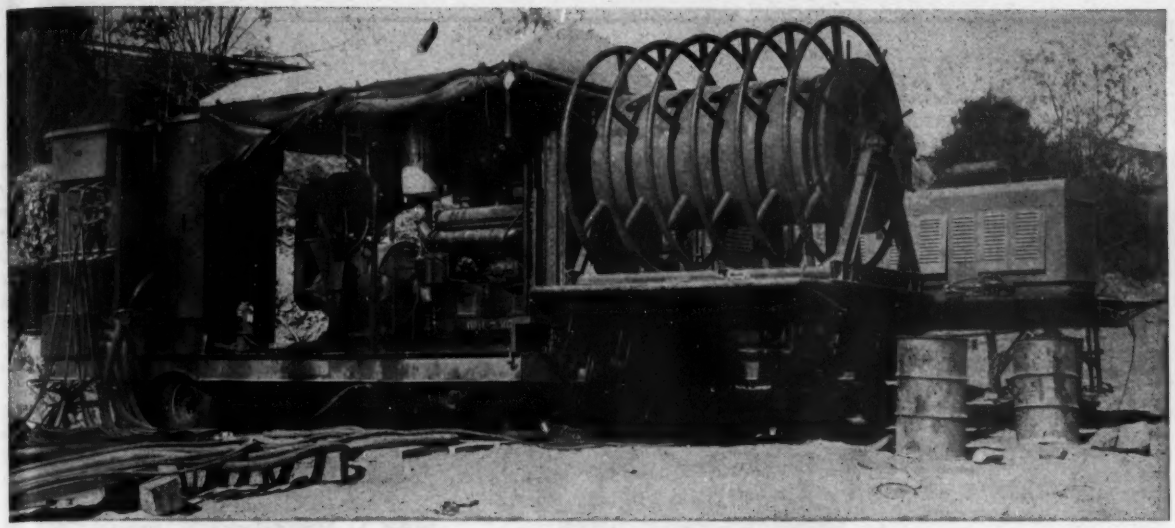
Left: Mud-pumping equipment has two units: (1) a 7¼-by 12-in. triplex pump mounted on one trailer with a 400-hp. motor, and (2) a 7¾-by-16-in. triplex pump mounted on another trailer with a 250-hp. motor. The entire slush-pump drives are permanently mounted on the trailers, with the pumps themselves an integral portion of the trailer frames. The trailer units complete with pump, motor, and V-belt drives and guards are legal in respect to road width. Electric control equipment is on panel in right foreground

Below: Mud-testing station contains all instruments necessary for rapid and accurate analysis of mud conditions. This permits continual and accurate mud control and prevents hazards of blowouts due to use of improper mud while drilling through high-pressure strata



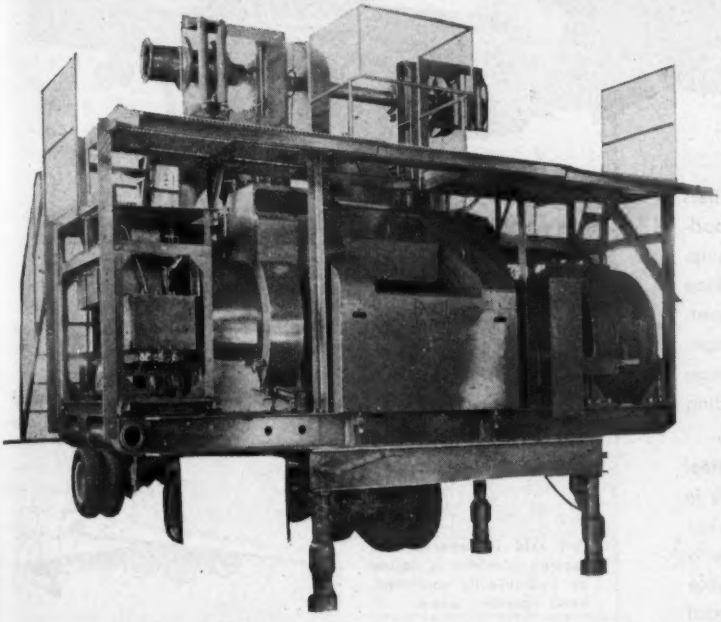
Below: Blowout preventor (Cameron) being lowered into position below derrick floor. Rotary table is supported on drilling riser, and all drilling loads are imposed directly into ground through blowout preventor and remaining portion of drilling riser. Guy wires transmit torque loads to subbase



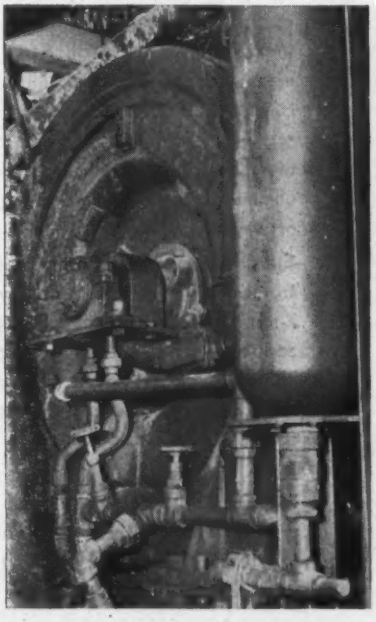


Above: Power plant consists of three 200-kw. direct-current generators (Westinghouse), each driven by a 12-cylinder natural-gas engine (Hall-Scott) equipped with an Ensign carburetor. At right of engine is cable reel used for handling and transporting electrical cables

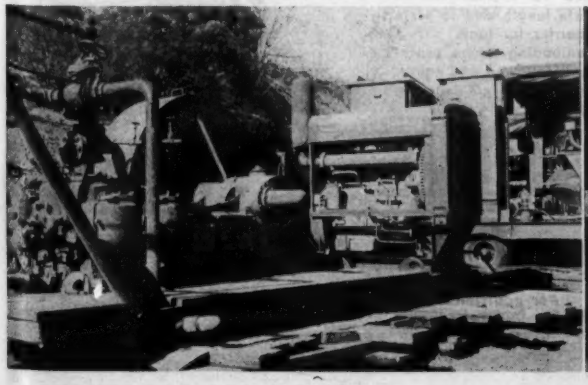
Below: Eddy-current brake (Dynamatic Corp.) mounted on draw-works drumshaft

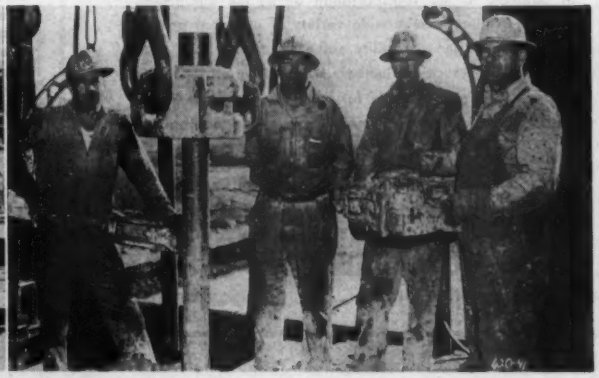


Above: Draw works (Emsco JA-1000) is mounted below derrick floor. A special extended catshaft places the catheads at a convenient working height above derrick floor



Below: Auxiliary pumping unit (Gardner-Denver) equipped with Waukesha engine is used in handling mud between pits and tanks. Right: Daylight drilling crew consists of Paul Carr, Forest Engles, Glenn Goft, and Cecil Chentley. Byron Jackson elevators and Web Wilson tongs are used in handling pipe





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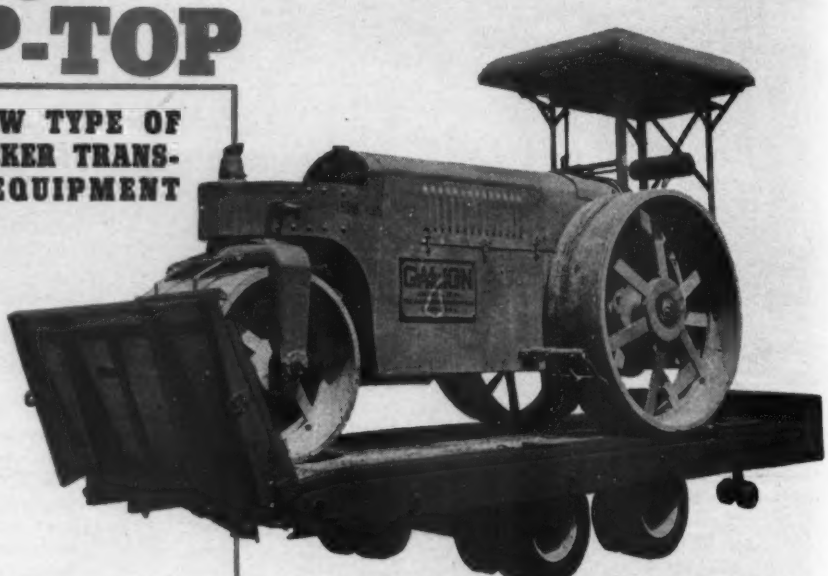

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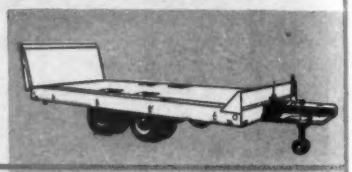
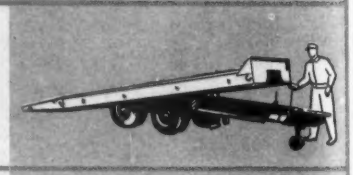
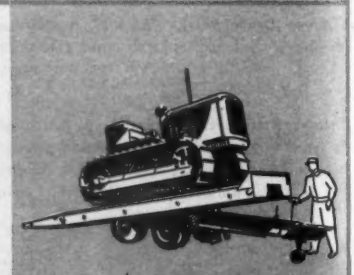


1. Trailer before loading.



2. Tail skid is lowered and loading platform is raised by hydraulically controlled, hand operated pump.



3. Equipment is driven on under its own power with tail skid serving as ramp. Release valve is then opened so that loading platform will return to its original position and automatically lock. The tail skid is then hydraulically raised to shorten overall vehicle length and to serve as barrier for load. In unloading, same procedure is followed and equipment is driven off under its own power.

TIP-TOP TRAILERS

Patent Pending

For additional information on TIP-TOP Trailers, write for folder R.

Design of TALL Refinery Frames

by Simon W. Lewaren*

SINCE the advent of catalytic cracking, supporting structures in many refineries have assumed skyscraper-frame appearances. Unlike the completed skyscraper, its frame skeleton is left exposed.

The tall refinery frame is usually an assembly of diagonal bracing, especially at the column bases. Where the problem of accessibility to valves and flanges during erection and operation exists, the initial layout deserves very careful study. Cost of fabrication and erection also plays an important part, and appearance, desired by some, is usually relegated to secondary importance.

All these factors may be taken into consideration when designing the tall refinery frame without crossbracing and utilizing moment connections in the framing between beams and columns. In view of the fact that such type of structure is statically indeterminate, the interaction of its members should be studied thoroughly to enable the designer to employ simple methods of analyses.

*S. W. Lewaren & Co., 1572 North Halstead Street, Chicago.

Since all deflections and rotations in the structures' members occur rapidly and in sequence, their successive deformations can be described in phases:

Phase I: Fig. 7

Wind initially deflects the windward column, producing maximum deflection on top; Δ_D, and rotation Θ_D.

As shown	Also
$\Delta_A > \Delta_B$	$\Theta_A > \Theta_B$
$\Delta_B > \Delta_C$	$\Theta_B > \Theta_C$
$\Delta_C > \Delta_D$	$\Theta_C > \Theta_D$

Assuming fixity at all points by moment connections, the column can then be considered as a series of cantilevered beams (A, B, C, and D) which are fixed at their respective floor levels, but free to move, though guided, at their respective floor levels above. Although they have all deflected, their deformations were not the same, showing increases from succeeding level to level. Since the girders connecting the windward column to its interior column are fixed at both ends, the joint at the floor level below can be assumed to offer restraint in deflection and rotation of that above, despite the fact that it has gone through a comparatively smaller deformation. The interior column is not deformed during the phase, hence a hump and sag deformation is produced in the girders.

Phase II: Fig. 8

The hump and sag produced in Phase I exhibits deflection and rotation strains. Since these strains are in direct proportion to those in the windward column, they can then be assumed to produce rotation and deflections in the interior column, and also in the girder connecting the interior and leeward columns. Note the elimination of the hump and sags in the windward column and in the

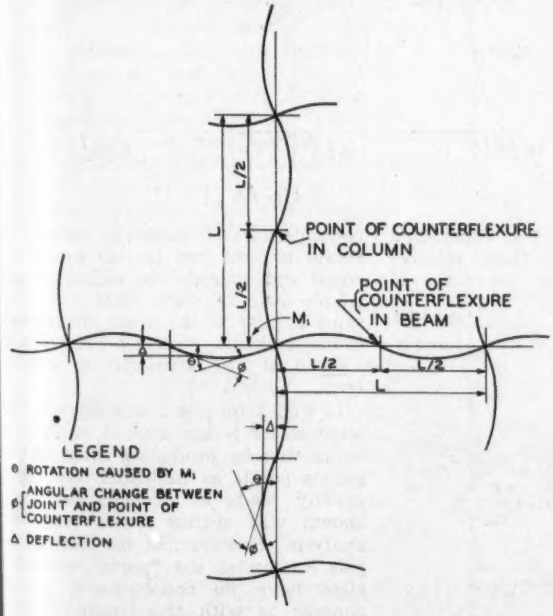


Fig. 1—View at a joint showing deformations

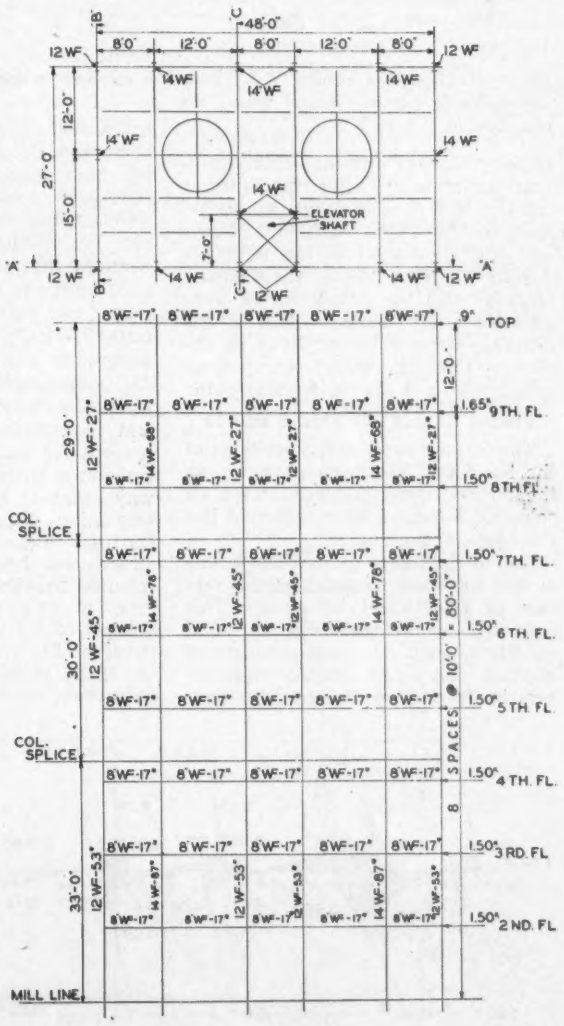


Fig. 2

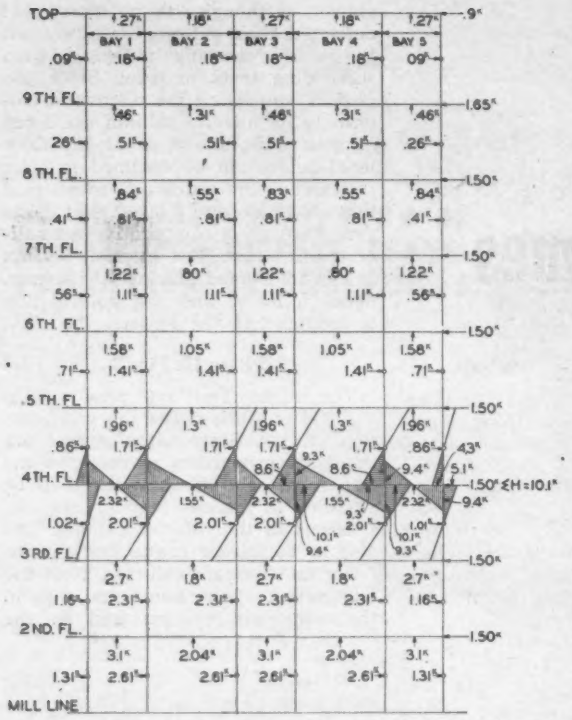


Fig. 3—Portal method, section "A-A." Values of moments in this and following figures (shaded areas) are expressed in "k (ft.-k)

girder framing into it. This condition occurs only after the interior column has gone through its deformation. Therefore, with the hump and sag eliminated in the members during the first phase, they apparently exhibit the properties of comparative stiff members. This is the ultimate effect to be achieved by designing with allowable bending stress which does not approach yield point.

Phases III and IV: Figs. 9 and 10

These two phases are repetitious of the foregoing. The final phase shows the entire frame displaced with all columns deformed alike, wherein lies the basis of the analysis.

One of the prime desired conditions is that all deformations along a section of floor level be equal. This can only be achieved by an ideal condition, such as equal moment of inertias, and equal lengths of members in the section. Because this cannot always be the case, the static mechanical properties of the members are taken into account along with the moments produced.

In Fig. 1, deflections and rotations are considered and equations derived from a "least work" analysis. From "work" equations the strains are expressed in terms of the moment caused by (in this case) wind shears, and the physical and static mechanical properties of the members in interaction.

Several investigators have previously written papers on "exact" methods of analysis for tall frames subject to wind stress. All of these methods involved lengthy and unwieldy "work" equations which made analysis cumbersome and tedious. However, methods have been developed which by reasonable assumptions, wind shears can be distributed through the frame, and induced moments can be computed. These assumptions are: (1) All points of counterflexure on beams and columns are (except for modifications) at the midway point of their respective lengths. (2) Horizontal wind stresses can be distributed by allocating a certain amount of the total stress at the cross-section considered by their position or their relative stiffnesses, such as in the cases of columns. (3) All moments tending to rotate a joint can be set up to be equal and opposite for satisfying the simple rule of static ($\Sigma M = 0$). The same applies to the wind shears and induced shears whereby $\Sigma H = 0$ and $\Sigma V = 0$ at any cross-section considered.

In Fig. 2 for the frame shown, the wind stress is assumed at 20 lb. per sq. ft. thereby producing shear at the panels points as indicated. Applying gravity loads as needed, the sizes shown will suffice for a tentative analysis. However, in the first analysis known as the "portal method," sizes have no consequence; prime concern is with the length of the members themselves. In this method,

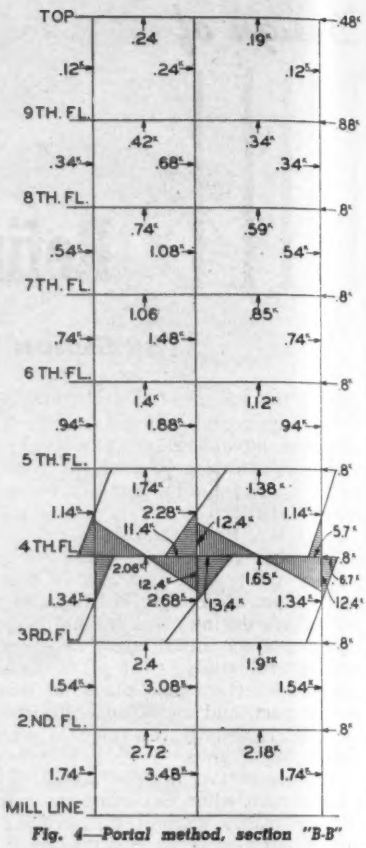


Fig. 4—Portal method, section "B-B"

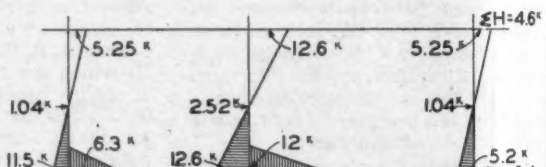


Fig. 4-A

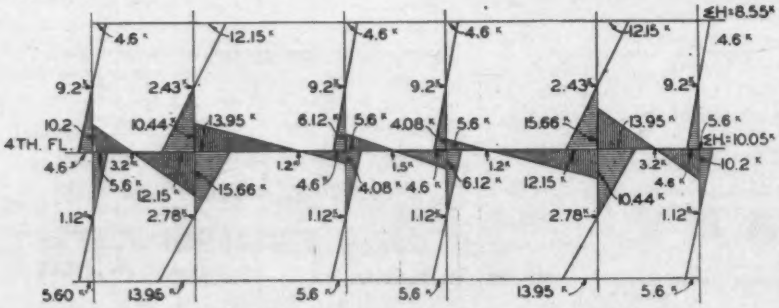


Fig. 3-A

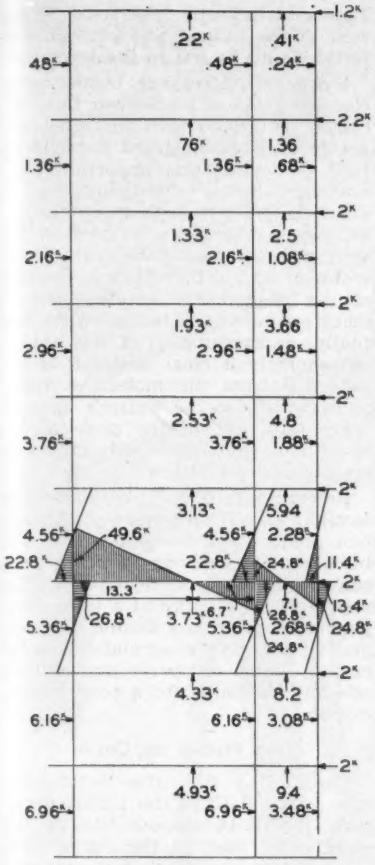


Fig. 5—Portal method, section "C-C"

two assumptions are made: (A) All points of counterflexures are, except for modifications explained later, at the midway points of all beams and columns. (B) Wind shears are equally distributed to all interior columns, and only one-half of the load applied to the interiors will be distributed to the exteriors. The basis for this assumption is that exterior columns usually carry one-half the load of interior columns. Since this is not always the case, modifications of assumption (B) will be made as shown later. Considering Section "A-A," as shown in Fig. 2, for analyzing the portals about the fourth floor (see

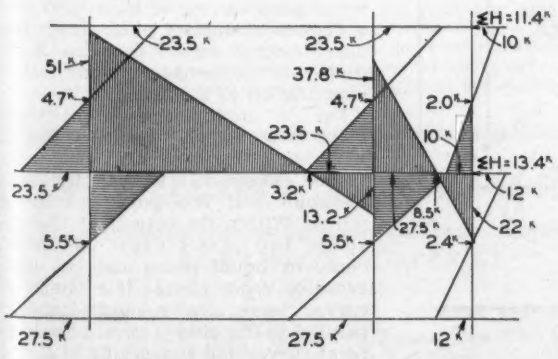


Fig. 5-A

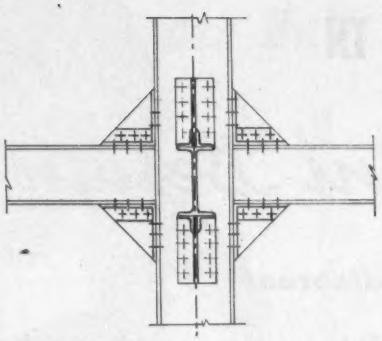


Fig. 6—Typical moment connections

Fig. 3) resulting stresses may be obtained by applying the simple law of statics.

$$.9 + 1.65 + 1.50 + 1.50 + 1.50 + 1.50 + 1.50 = +10.1^k$$

From assumption (2)

$$1.02 + 2.01 + 2.01 + 2.01 + 2.01 + 1.02 = -10.1^k$$

$$\Sigma H = 0$$

To obtain the total shear at any floor, add shears above it and include the one applied at the floor considered. This procedure is to be used for both of the methods given here.

Taking for example the first interior joint as a free body:

$$V = \frac{1.71^k \times 5.0 + 2.01^k \times 5.0}{8} = 2.33^k$$

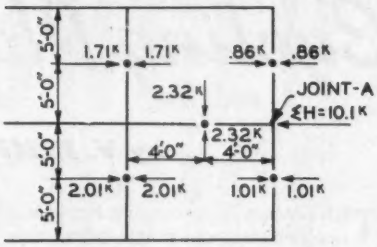
Moment in column above
$= +.86^k \times 5 = +4.3'^k$

Moment in column below
$= +1.0 \times 5 = +5.0'^k$

Moment in girder
$= -2.33 \times 4 = -9.3'^k$

ΣM @ Joint A
$= +4.3'^k + 5.0'^k - 9.3'^k = 0$

The modifications previously referred to are shown in Fig. 5, the bent



along the section line "C-C." Of the columns specified in Fig. 2 only one exterior column is considered carrying a smaller load than the interior one. Note that there are two adjacent columns of the same section, and the girder framing between them is practically three times as long as the adjacent one and therefore, one-third as stiff when assuming both girders as having the same sections.

The modifications in assumptions then are: (a) The two columns having the same sections are bigger than the third, or exterior one, and shall receive the same shear, but the exterior column having the smaller section shall receive only one-half the stress as allocated to each of the other two in the same bent. (b) Since the girder spanning the columns of the same section was considered one-third as stiff as its adjacent girder, then the point of counterflexure of the long girder can be assumed one-third the distance away from the side of the stiffer and shorter girder.

When incorporating these assumptions into the procedure, shear and

(Continued on page 122)

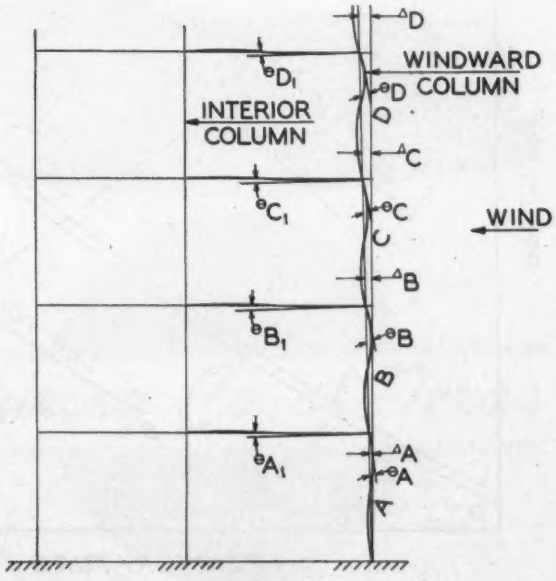


Fig. 7—(Phase I)

SOME HIGH POINTS IN

Cycling Plant Design

by V. E. Middlebrook*

This is a companion article to the one by the author on "Gasoline Plant Design" which appeared in the Journal issue of February 12, page 102.

THE process of recovering liquid hydrocarbons from single-phase reservoirs existing under conditions of temperature and pressure above the critical point of the reservoir mixture is called cycling. It is now rather generally conceded that the term is a misnomer since cycling suggests an immediate return of the injected gas to the producing wells which, of course, does not happen. Indeed, if this were the case one of the purposes for injecting residue gas into the formation, i.e., the sweeping of the reservoir fluid toward the producing wells, would be vitiated.

To avoid confusion it is well for the reader to understand at this point that the term "fluid" as used in this paper connotes the homogeneous hydrocarbon mixture as it exists above the critical point. In addition to furnishing the driving force to deliver the virgin reservoir fluid into the producing wells, injection of the residue gas remaining after fuel requirements and extraction of liquid products accomplishes the equally important function of sustaining the bottom-hole pressure within certain required limits. This precludes loss of valuable liquid products by preventing the occurrence of the well-known phenomenon of retrograde condensation.

In other words, by avoiding retrograde condensation the trapping of some of the heavier material in porous space in a manner which reduces final recovery is prevented. In this connection the Bureau of Mines has done extensive work on several single-phase reservoirs to determine expected losses due to retrograde condensation within the producing formation. This work correlates losses of butane and heavier against heptane and heavier content of the reservoir fluid and indicates that some 10 per cent of the butane and heavier material would be left in the formation.

*Manager Gas-Gasoline Department, Tulsa area, Shell Oil Co., Inc.

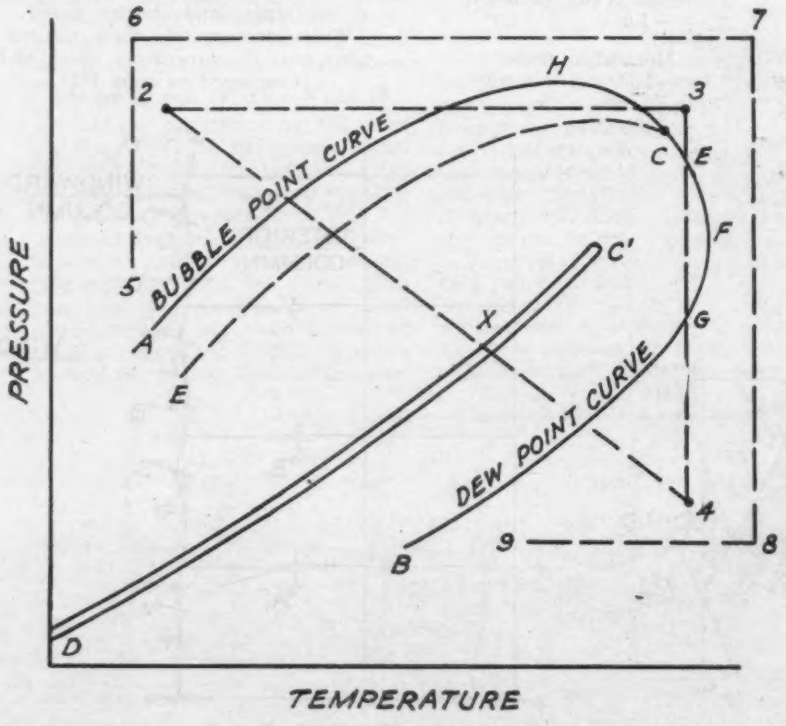


Fig. 1

Since the retrograde condensation characteristics of a reservoir fluid are closely associated with and affect the design of a cycling plant it might be well to review this important phenomenon before discussing cycling plant design. Although many technical papers have been written on the subject in the past few years, there seems to be a rather hazy conception of the phenomenon on the part of many engineers and technologists. Actually, no explanation of this apparent anomaly is clear unless it is approached from the molecular viewpoint which, in the writer's opinion, takes into account the physical aspects in a manner which makes it readily understandable.

Referring to Fig. 1, we have the familiar multicomponent hydrocarbon phase diagram composed of the bubble point and dew-point curves converging at the critical point. The vapor-pressure curve of a pure component is shown as a double line suggestive of bubble point and dew-point curves, which of course are actually one and the same for a pure hydrocarbon.

Two Phases on Curve

Considering first the vapor-pressure curve D-C' of the pure component, it will be obvious that at any point other than on the curve there can exist only a single homogeneous phase. On the curve, however, two phases exist—the liquid or more-dense phase and the vapor or less-dense phase. Progressing upward along this curve the densities of the two phases approach each other until at C,' the critical point they are equal, and a single homogeneous phase exists which is neither liquid nor vapor and which in a way may be thought of as being a fourth state of matter.

Since only a single homogeneous phase exists at points other than on the vapor-pressure curve, it will be clear that raising the temperature of the fluid represented by point 2 along 2-3 isobarically and then reducing the pressure along 3-4 isothermally causes no abrupt change of phase. However, in going directly from 2 to 4 the vapor-pressure curve is crossed and a distinct change of phase from liquid to vapor occurs at point X by supplying the necessary latent heat of vaporization to the liquid at X.

For a multicomponent mixture there is no vapor-pressure curve as such, but rather somewhat of an egg-shaped envelope formed by the bubble-point and dew-point curves as shown. Within the bounds of the envelope two phases exist: the more-dense or liquid phase and the less-dense or vapor phase. If a family of curves were drawn approximately parallel to the bubble point and dew-point curves and converging at C, the critical point, they would represent

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percentages of liquid and vapor existing at any point selected on the curves. For example, a point on the curve E-C would represent 85 per cent liquid and 15 per cent vapor. Of course, as the curves approach the dew-point curve the percentage of vapor increases and that of the liquid decreases. Outside the envelope only a single homogeneous phase is encountered. In other words, by changing the conditions of temperature and pressure of material at point 5 to proceed through points 6, 7, and 8 to point 9, no distinct change of phase occurs although the process involves passing from a point in the region of complete liquid to one in the region of complete vapor.

Keeping the foregoing in mind, it will now be easier to understand the molecular theory involved. Fluid at point 3, which is above the critical, is under such high pressure that the lighter more numerous molecules, due to their proximity, exert sufficient attractive force to hold the heavier molecules in solution in the single homogeneous phase. Expanding the fluid isothermally along 3-4, the lighter molecules spread apart and lose some of their attraction for the heavier ones, and concurrently the attraction of the heavier molecules for each other has a tendency to overcome the reduced attractive influence of the lighter for the heavier ones. Droplets of liquid then begin to form at E as the critical envelope is crossed. Opposite F along the path 3-4, the amount of liquid reaches a maximum and upon further reduction in pressure the kinetic energy of the lighter gaseous molecules bombarding the liquid surface is reduced, and the process of normal vaporization sets in until at point G the fluid is completely gaseous.

That retrograde vaporization will occur along the path 3-2 becoming a maximum opposite H at which point normal condensation sets in will be clear from the above discussion.

Processes Similar

With the foregoing discussion of the retrograde phenomenon the following relative to plant design will be clearer. Apparently, some engineers who are quite well versed in the technology associated with natural-gasoline plants, view the cycling plant with alarm as though it were a mysterious and abstruse unit. Actually, with the exception of some of the higher-boiling-point constituents which compose the so-called distillate, the products recovered in cycling plants are identical with those recovered in natural-gasoline plants. Further, the processes employed for liquefying these components are much the same as those used in gasoline plants, the principal difference being the pressures involved.

The fluid to be processed comes from the well head at pressures ranging between 2,000 and 3,500 psi. and at temperatures from 140° to 160° F. The field gathering system is usually designed to allow for a maximum pressure drop of about 100 lb. The fluid is cooled to a temperature consistent with economical approach to available water temperature, and then the pressure is reduced to the desired absorption pressure which ranges between 1,500 and 2,000 lb. Residue gas from the main absorber as well as from other points in the process cycle is taken into compressors for boosting to the required reservoir injection pressure which is considerably higher than well-head shut-in pressure.

Needless to say the higher the absorption pressure the less horsepower required for residue injection. As yet, however, absorption pressures seldom exceed 1,800 lb. due to a number of economic factors which offset what would otherwise be very attractive investment savings in compressor horsepower. For example, at absorption pressures in excess of 2,000 lb. loss of absorption oil by retrograde vaporization becomes quite sizable. To counteract this loss by increasing the weight of the oil reduces its efficacy as an absorbent due to increase in its molecular weight, thus requiring a greater oil-circulation rate to sustain the molal absorbent to gas ratio and accomplish desired extraction efficiency. Further, the heavier oil reduces over-all heat-transfer rates in exchangers, coolers, etc., and of course increases pumping-horsepower requirements. In addition, the cost of vessels, pipe valves, and fittings increases materially with increase in pressure. Aside from the foregoing points, absorption near the critical involves consideration of phase-equilibrium problems which suggests that higher absorption pressures would not be economical from the standpoint of required absorption-oil circulation rate as affected by reversal of the equilibrium constants. This point will be discussed later.

Following cooling and pressure reduction some of the hydrocarbons liquefy as a result of retrograde condensation, the remaining constituents—which are then definitely in the gaseous phase—being contacted conventionally with absorption oil.

Since large quantities of methane and ethane are absorbed, the rich oil must be "rough stabilized" by flashing, substantially isothermally, at reduced pressures. Similarly, the retrograde product is flashed, usually in separate vessels from the rich oil, the vapors from both being commingled for further handling. The flashed vapors are processed either by recompression, reabsorption, or a combination of the two when they contain sufficient quantities of the desirable constituents to justify the expense of handling.

Often vapors from the first, or high-pressure flash, are recompressed immediately for reservoir injection. Normally three or four flashes are required before the rich oil and the retrograde product are sufficiently stable to be fed to the distillation equipment.

Selection of optimum pressures for flashing, so that maximum quantities of methane and ethane are eliminated while retaining as much propane and heavier as possible, presents one of the major process problems. The retrograde product is stripped of remaining light components in a separate still and a portion of the bottom product is processed further in another column to obtain specification absorption oil. The final distillation and fractionating processes are much the same as in the conventional gasoline plant, the fractionating equipment requirements and arrangement depending upon products to be recovered.

Reasonably Accurate Analysis

Although there is much to be learned about high-pressure absorption, comparatively recent developments in technology and hydrocarbon phase equilibrium data permit reasonably accurate analysis of the problem. One of the most interesting facts is that the effective molal oil to gas ratio almost doubles after the absorption oil has contacted the first few trays. This is due to the immediate absorption of large quantities of methane and ethane.

It is interesting to note that while the equilibrium constants for methane at the high absorption pressures being employed are continuing to decrease normally with increase in pressure, those for ethane are just beginning to reverse and the ones for the heavier constituents reflect definite retrograde characteristics, i.e., they increase with increase in pressure. This leads to the inevitable conclusion that were it not for the fact that the molal absorbent to gas ratio increases substantially due to methane and ethane absorption, the amount of lean oil to be circulated would be greater at the high pressures than it would be at some carefully selected lower pressure. Indeed, the amount of lean oil required for extraction of a fixed per cent of butane as the key component will vary only about 12 per cent over the range 1,000 to 2,000 lb.

The equilibrium constants for propane and the heavier constituents increase quite rapidly at pressures above 2,000 psi. Since this is true it would appear that aside from the opposing influence of factors mentioned previously, absorption pressures will be limited to the adverse economics of an increasing lean oil rate. In other words, it seems probable that further research along the lines of phase equilibrium may indicate that the adverse effect of increasing equilibrium constants with increasing pressures, for the heavier components, will more than offset the favorable effect of increased volume of absorbent due to dissolved methane and ethane.

QUESTIONS on TECHNOLOGY

by ***W. L. Nelson***

Consulting Engineer

Drying Oils by Distillation

We have heard that butane and propane can be dried by distillation. Can you direct us to references on this method of drying?—R.A.C.

The only discussion of this nature that is available to this department is the paper by G. C. Gester, Jr. "Design and Operation of a Light Hydrocarbon Distillation Drier," which was presented before the regional meeting of the American Institute of Chemical Engineers in San Francisco in August 1947. It pertains to the drying of the hexane-like fraction or naphtha used in a solvent dewaxing plant. This system is shown in Fig. 1 on this page. Wet hexane is introduced high in the fractionating column, or if it is a vapor or contains slugs of water it can be introduced into the reflux accumulator as done by Gester.

The amount of reflux (or more particularly the amount of vapor that goes overhead) must be at least large enought to carry all of the water with it. The water amounts to that in the feed plus that dissolved in and recycled with the reflux. Thus, if the vapor pressure of water at the top temperature is "v," the total pressure is "π" and the pounds of water is W, then the moles of vapor overhead must be:

$$\text{Mols oil vapor} = \frac{\pi - v}{v} \times \frac{W}{18}$$

In addition, reflux may be required to cause the separation of the water in the fractionator or mainly stripper. The solubility of water in the oil is greater at the higher temperatures near the bottom of the column, and the vapor generated at the reboiler must act as a stripping agent in moving water vapor up the column.

This department has not heard of the use of this method in the dehydration of liquefied petroleum gases such as butane or propane. It probably could be employed but detailed information on the solubility of water in such liquids should be obtained.

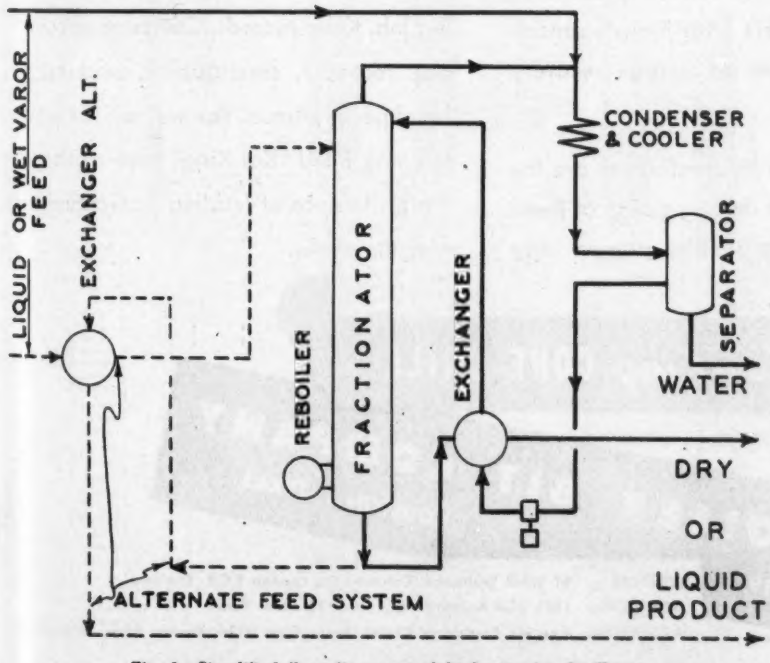


Fig. 1—Simplified flow diagrams—dehydration by distillation

Specifications of Microcrystalline Waxes

What are the specifications of microcrystalline waxes?—A, F. R.

Microcrystalline waxes are used for so many different purposes that general specifications have not been adopted. Each user settles upon suitable properties with his supplier and when a new use appears, another wax is developed. In addition, the base stock from which the wax is produced imparts particular properties, especially if the wax is made from tank bottoms. Table 1 indicates the general properties of some waxes tested at University of Tulsa.

TABLE 1—SOME MICROCRYSTALLINE AND PETROLATUM WAXES

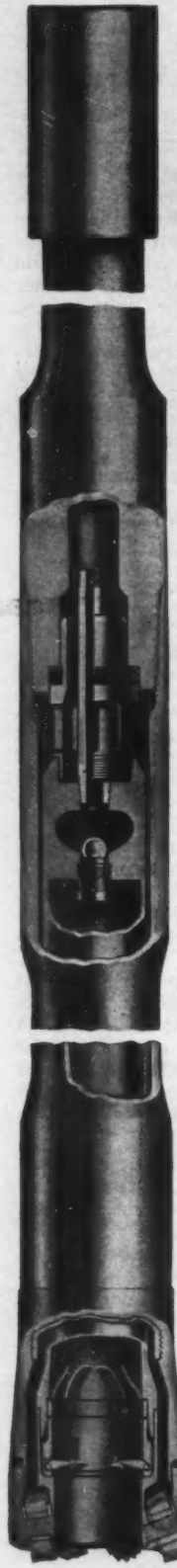
	Melting-point, °F. (D127-30)	Consistency (D 217-44T)	Needle penetration (D-5-25)	Flash-point, °F.	Gravity, °A.P.I.
Petrolatum	106-118	200-240	....	360-370	....
	112-124	160-200	....	410-430	....
	127-137	170-200	....	360-370	....
Microcrystalline	155 plus	.....	25-35	460 plus	36
	166 plus	.....	15-25	460 plus	36
	170-175	.....	10-20	460-500	37
	185-190	.....	5-15	470-500	....
	190-197	.....	2-10	480-500	21-22

Melting point or softening point is generally useful because it indicates the temperature at which baths of liquid wax must be maintained. Flash point is important because it indicates relative fire hazards. Penetration or consistency is perhaps most important of all. Other important properties relating to plasticity, brittleness, or flexibility are not reported because adequate testing methods have not been adopted.

About the only specification that has been widely used is the joint Army-Navy Specification JAN-P-115 which was used so extensively for specifying the dipcoating compound employed in packaging overseas shipments during World War II. The main specifications are:

1. **Softening point** must exceed 145° F. This test involves the temperature at which the wax will melt or slip from within a glass tube.
2. **Needle penetration** is under 60° at 77° F.
3. **Homogeniety.** The molten wax does not stratify into components nor deposit a residue.
4. **Cohesion.** A specially prepared coating of the material on a strip of paper does not crack or flake at —10° F.
5. **Contraction upon solidification.** A coating applied to the paper wrapping of a box does not check or crack.
6. **Water resistance.** The increase in weight during immersion in water is less than 2 per cent.
7. **Corrosion.** Does not corrode steel, copper, or aluminum.
8. **Setting.** A 1/64-in. coating will set in 2 minutes.

Obviously, these qualities are determined in special equipments and by specified procedures.



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SELECTIVE PRODUCTION by Alternate Layer METHOD

by George Weber

A NEW gravel-pack type of well completion termed the alternate-layer method has shown successful results in experimental and semi-experimental use in South Texas. The new technique was developed, with the aid of numerous engineers and operators, by Thomas S. West, geologist and engineer associated with Al Buchanan, San Antonio drilling contractor and oil operator, and Blanco Oil Co.

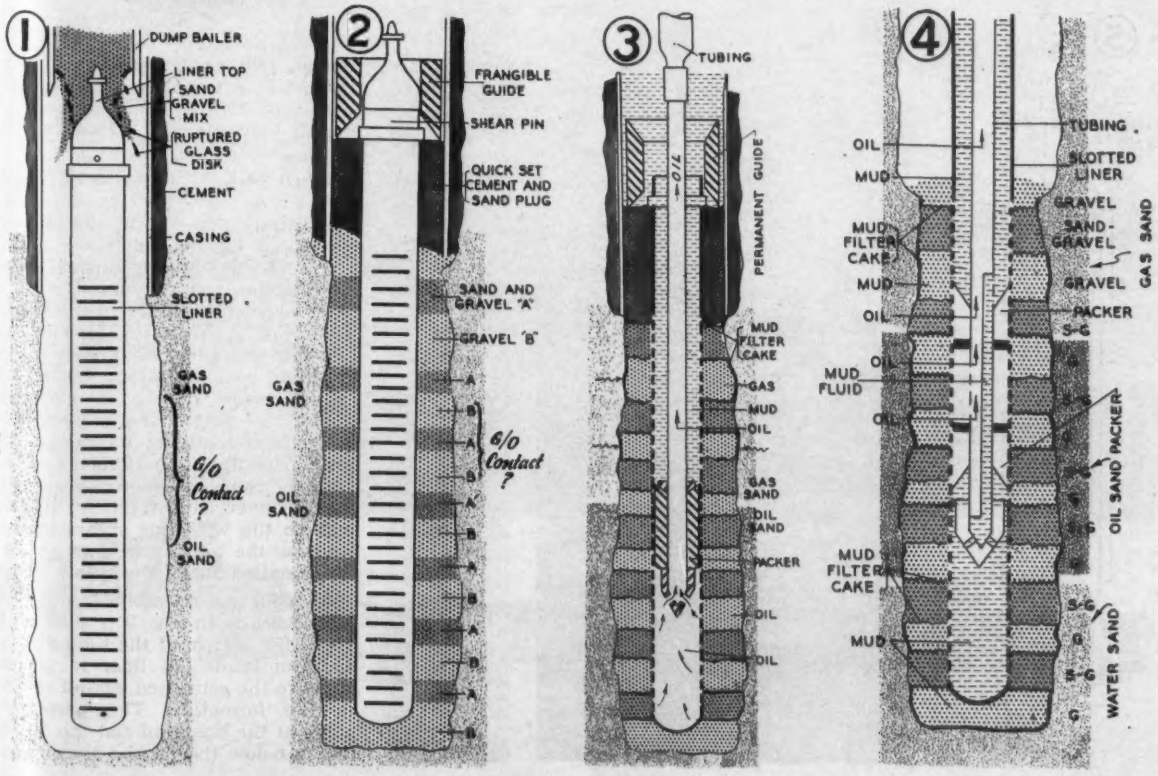
The alternate-layer method is a recent result of a long-term study of gravel-packing procedure, the earlier results of which were published in West's paper entitled "A New Well-Completion Technique," A.I.M.E. Petroleum Technology, September 1946. The alternate-layer method provides a practical means not only of selection of a particular section of producing sand for fluid withdrawal, but also allows the operator economically to raise or lower that section open to production, maintaining complete shutoff both above and below the selected producing horizon. Unconsolidated sands and shales are effectively contained in place in the formation, and sand production and shale caving are

1.—Initial steps of alternate-layer gravel packing in completing a well whose open section is exposed to both gas and oil sand, location of the gas-oil contact unknown. At this stage the first, or bottom sand-gravel layer is being dumped as the liner top breaks the glass bottom of the dump bailer. The diagram is not drawn to exact scale, the diameters of hole, liner, etc., being exaggerated with relation to length of open section

2.—As soon as the quick-set plug has been dumped around the liner's upper blank section, a frangible guide, later broken out, is set to center the top of the liner in the casing

3.—The single packer assembly is run in the liner and its level adjusted by trial and error to provide most efficient oil production with complete gas shutoff. Ability to raise and lower the packer precludes prior location of the gas-oil contact by more expensive means

4.—By exposing both gas and water zones to high-pressure mud, a thin intermediate oil section may be produced with the double packer assembly. Filter cake, exposed to a greater differential pressure from the formation by raising or lowering of the packer, readily backflows and opens the section to flow from the formation



prevented. In addition, it affords a means of controlling or minimizing the coning of gas or water.

Having worked satisfactorily in two shallow-well tests to date, the gravel-packing method shows promise of adaptation in deeper wells where it should represent an important contribution to conservation of reservoir energy and greater ultimate oil recovery at nominal cost.

Details of Procedure

The completion procedure involves a number of mechanical operations which have proved workable in field tests. It is particularly adaptable to wells threatened with excessive gas or water encroachment, where gas-oil and oil-water contacts in the producing formation are not definitely located. It has several variations, the simplest of which is applicable to a well whose open producing section is exposed to gas and oil sand, as shown diagrammatically in Fig. 1.

Following thorough cleanout to remove all mud from the sand face, a small amount of gravel is dumped on bottom and a capped liner, slotted throughout the length of the open sand section, is run with an overshot on a wire line and released on bottom. Alternating layers of gravel and a sand and gravel mix are then placed around the slotted liner section. Gravel of a size sufficient to screen completely the producing sand is used in both types of layer. Its grain size should be about six times that of the producing sand, at the 10 per cent point on a sieve analysis curve. Gravels which will screen most South Texas sands vary from 0.0469 to 0.0787 in., averaging 1/16 in. in grain size. For the mixed layers, sand of a grain size to result in a mix with permeability equivalent to the producing sand, is selected. Sand is added to the gravel in proportions sufficient to fill the gravel pore spaces.

Each layer is placed separately around the liner by use of a bailer fitted at the bottom with a glass disk, (Fig. 6) which shatters on contact with the liner top. Following the first dump, the bailer is run to bottom around the liner, centering the base of the liner in the hole. Since a dry sand-gravel mix would stratify while settling through fluid from the liner top to the desired level, a binder is added to the mix before it is dumped. Binders are available which will effectively hold the sand and gravel together while being dumped, but which will later be forced out of the layer by fluid flow from the formation at pressures of less than 100 psi. This assures placement of a uniform layer whose permeability after removal of the binder, will approximate that of the formation. Alternating layers averaging about 1 ft. in thickness are thus placed between total depth and the casing seat.

When pickup on the dump bailer line shows that the top layer has reached the top of the slotted liner section, a mix of quick-set cement and sand is dumped around the blank liner section and a frangible guide is run to center the liner in the casing, as in Fig. 2. After the cement plug has set, the guide is broken up by spudding with the dump bailer. Top of the cement plug is then checked for correct height and a permanent guide is run around the top of the liner. The liner top is then engaged with the same overshot used in placing the liner on bottom. An upward pull on the wire line shears the pin securing the top to the liner and the top is pulled out of the hole.

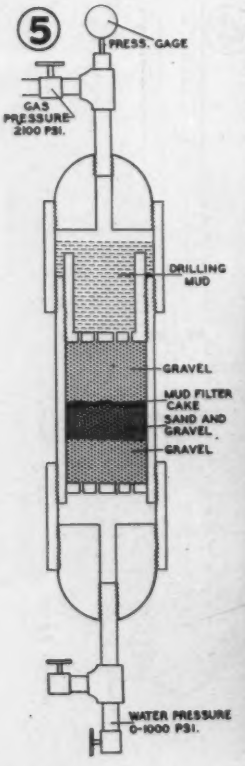
A packer assembly as shown schematically in Fig. 3 is then made up on the bottom of the tubing string and run inside the liner to a point opposite the estimated gas-oil contact in the formation. The permanent guide at the liner top and the conical fitting below the packer assure posi-

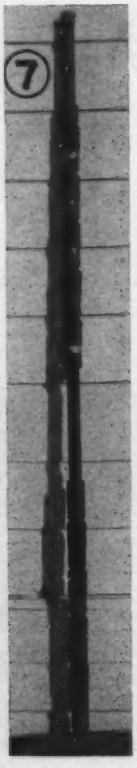
5.—Schematic drawing of the pressure test bomb which was used in laboratory tests to determine the formation of filter cake, and back-flow characteristics of several types of drilling muds

6.—Well head of an experimental test of the alternate-layer gravel-packing method. The ¼-in. lines arranged around the 7-in. casing connect to points along the circumference of alternating layers, used to test for flow or shutoff at various packer levels

7.—The double packer assembly, shown schematically in Fig. 4, comprises two assemblies each made up with four 2-in. cup-type packers spaced through 2 ft. of section. Packers are assembled on a ¾-in. pipe divided longitudinally between the packers, one half providing mud bypass to the bottom of the hole, the other half connecting slots between the packers with the tubing string for oil production

8.—Bottom section of dump bailer, showing glass disk used for dumping alternate layers around a 2-in. liner





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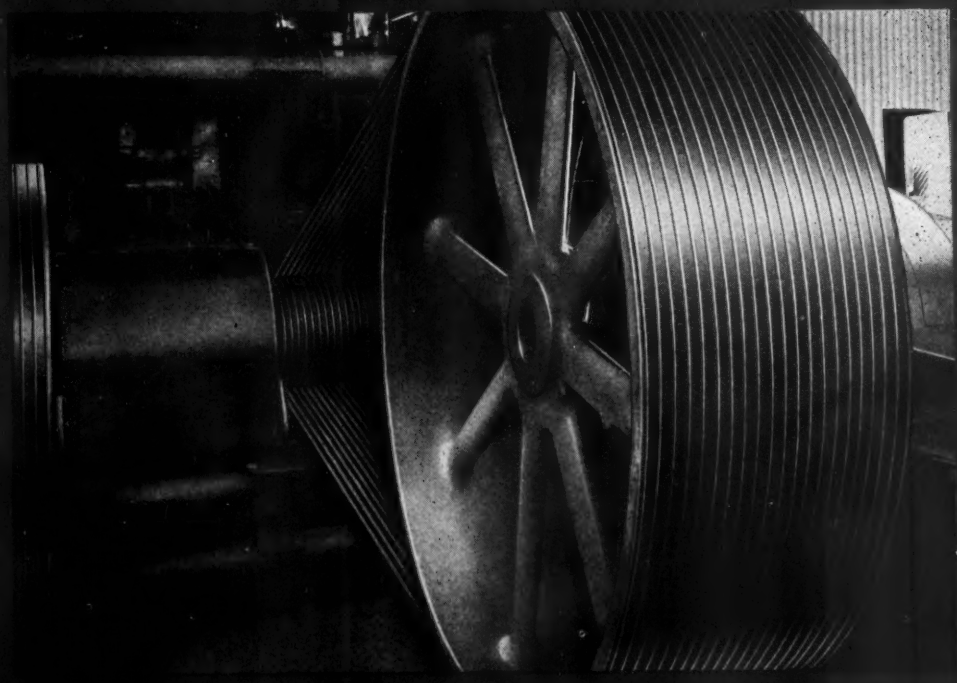

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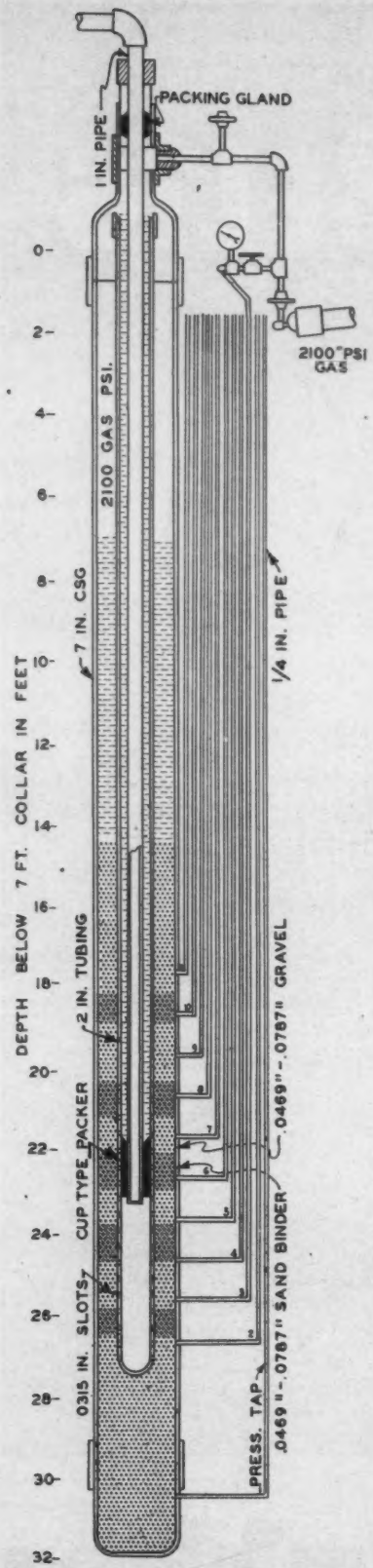


Fig. 3—Schematic section of the experimental test pictured in Fig. 6. Both the single and double packer assemblies were tested in this field laboratory unit, before the method was tested in two 1,700-ft. South Texas wells

tive entry of the assembly into the liner.

If a positive shutoff of the formation section above the packer is desired, the annular space between the tubing and casing is filled with mud of a sufficient weight to result in a bottom-hole presure slightly greater than that in the formation. Entering the open gravel layers through liner slots, the mud flows to the formation face and the upper and lower sand-gravel faces, where an impermeable filter cake is built up. Opposite the sand-gravel layers, mud forms a filter cake at the slotted liner openings.

Below the packer, a reversed pressure differential causes fluid flow from the formation to the well bore. Flow takes place through both gravel and mixed layers, since the latter also have permeability. The result is positive shutoff above the packer and unrestricted flow to the liner below the packer.

The tubing string may be raised or lowered while production tests are conducted, to determine the most efficient position of the packer in the liner. When the packer is raised past a section on which filter cake has formed, the impermeable wall is subjected to reversed pressure. Laboratory tests reveal that a back pressure amounting to 100 psi. will break down most filter cakes, and backflow mud and cake through the gravel layer to the liner, opening the layer to oil production.

The use of a hydraulic jack at the well head will enable one lease man to raise or lower the tubing string and packer within a short time. This operation allows the producer not only to select the producing level for maximum well efficiency, but to adjust the producing level to correct for lowering gas-oil contacts in the formation.

In a well where both gas and water shutoff is necessary, (Fig. 4) the double packer assembly pictured in Fig. 7 is employed. The same alternate layers are laid down around the liner. The upper section above the top packer is sealed off as in the single packer assembly. A fluid bypass between the two packers conducts the high-pressure mud through the assembly and a filter-cake seal sets up on all formation and sand-gravel faces in the water zone below the bottom packer. Oil from the intermediate zone flows through both types of gravel-pack layer, thence into the tubing through ports or slots drilled between the two packers. The length or thickness of oil section exposed to production is determined by the spacing of the packers and as in the single packer assembly, the tubing string may be lowered or raised to obtain most efficient producing conditions. This adaptation may be used for water shutoff alone, by spacing the top packer so that it remains opposite the blank section in the liner.

The alternate-layer method may be used without weighted mud when complete shutoff of top or bottom zones is not required. In such a case a double packer assembly designed without the fluid bypass and fitted with a solid conical tip, is used. The alternate sand-gravel layers, having permeability similar to the formation sand, tend to restrict vertical flow of water or gas. Water and gas intrusion may be further reduced by dumping alternate sand-gravel layers with lower permeability. This type of completion would be designed to reduce gas or water production to relatively small amounts rather than completely eliminating them.

Control of Coning

Still another variation of the method promises to provide means of controlling or minimizing vertical coning. By replacing the drilling mud with oil and continually supplying oil to the annulus between casing and tubing, there results a slow circulation of oil through the producing formation from the space above and below the packers to the zone being produced. This circulation maintains oil saturation in the zone in which coning normally occurs. Because of the relatively high viscosity of oil, particularly as compared to that of gas, coning may be prevented or greatly reduced.

While the alternate-layer method has not yet been applied to commercial oil wells, it has proved mechanically practical in the semiexperimental completion of two 1,700-ft. Cole sand wells in Jim Hogg County. One was a water well and the other a light gas well. These completions served principally as a test of the ability to exclude water and gas when the packer assembly was moved to expose an adjacent nonpermeable section. Data secured from these tests have been used for designing apparatus and evolving procedure for rapid and efficient application to deep wells.

Laboratory Experiments

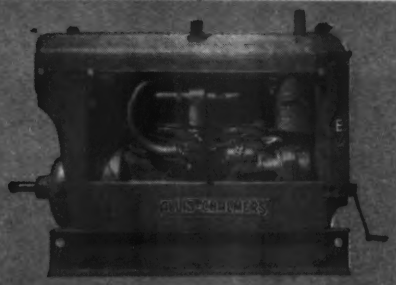
Field tests of the method were pre-

(Continued on page 128)

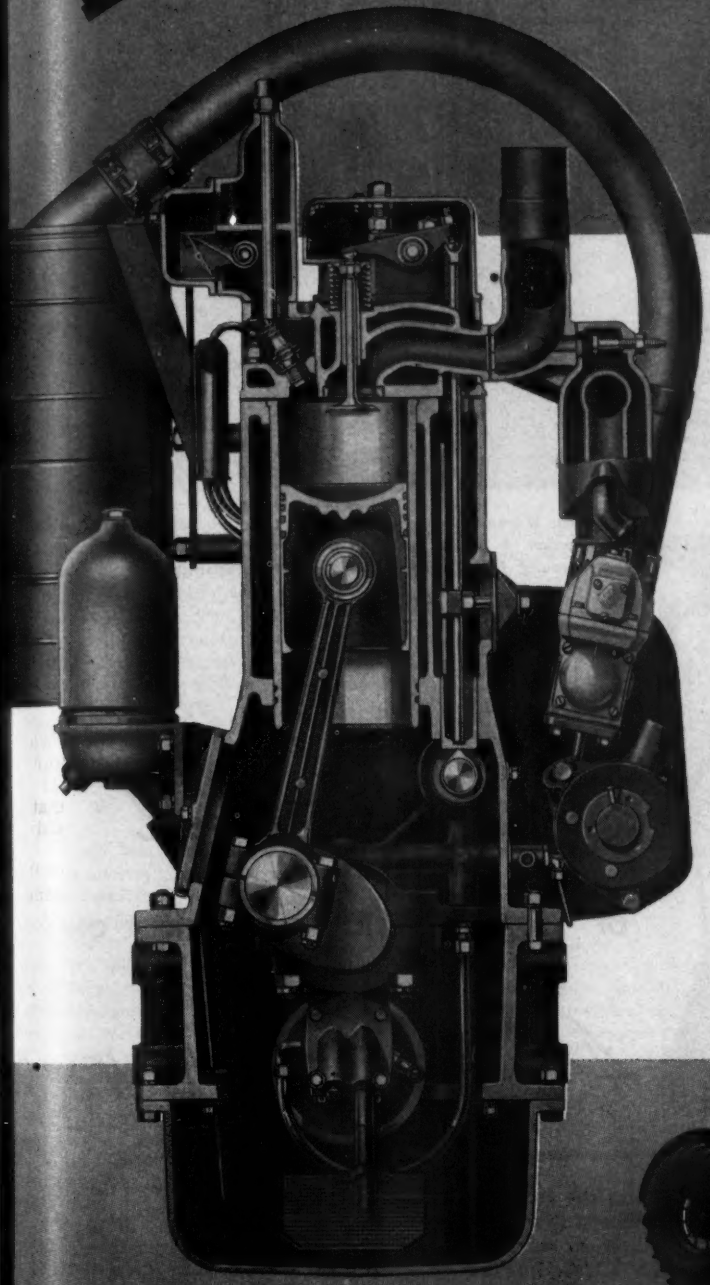
TABLE 1—TEST RESULTS WITH DIFFERENT KINDS OF MUDS

Type of mud—	Pressure used in building filter cake, psi.	Length of time pressure on cell days	Pressure required to flow filter cake back through .0469-.0787-in. gravel	Rate of back flow, cc. per sec. per 100 psi differential
Impermes and Zeogel in brine	2,000	13	100	14.8
Oil-base mud	2,000	8	100	7.5
Natural mud with Baroid and Aquagel from 7,000-ft. Wilcox well	2,100	5	300	5.7
Aquagel and water	2,000	13	100-300	19.0

Lubrication in



POWER UNITS or PULLING UNITS

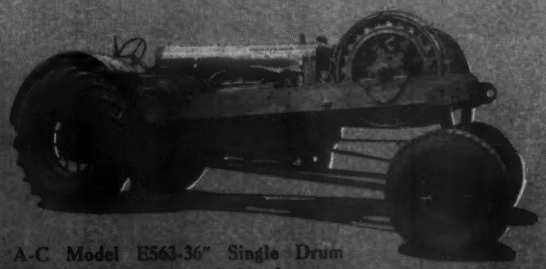


Only from an engine that is properly lubricated can maximum performance be expected under all operating conditions.

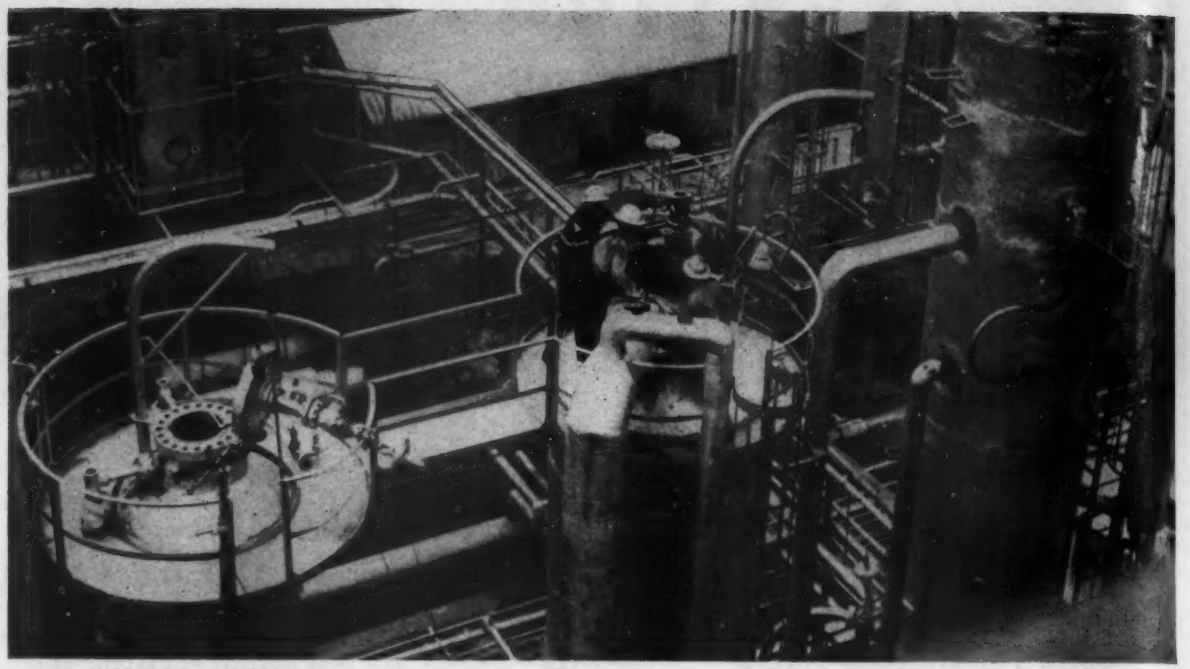
Allis-Chalmers Power Engines and Pulling Units are heavy duty tractor type slow speed engines, designed to give maximum power over long periods of continuous operation.

The tractor type large volume, full pressure lubrication system of these engines filters and provides a continuous supply of clean oil to all moving parts. A gear driven gear type oil pump, driven from the crankshaft forces the oil to all main bearings, connecting rod bearings, piston pins, rocker arm assemblies and timing gears. Even the clutch pilot bearing is lubricated from this system.

All engines in Allis-Chalmers Power Units, Skid Winches and Winch Tractors are designated as Slow Speed, High torque, Tractor type prime movers designed for services, requiring a wide range of governed speed in continuous operation.



A-C Model E563-36" Single Drum Winch Tractor, transmission is especially designed for winch work.



Above: Workmen removing top head from tall separator to permit inspection. A portion of the synthetic-crude tower appears in right foreground. Left: Houdry metal inspector calipering return bends of vaporizing heat tubes

FIRST *Turnaround* OF LEONARD T.C.C. UNIT TAKES ONLY *4,557 Man Hours*

Ranking among the front-row accomplishments in postwar refining are the new small cat crackers. The T.C.C. installation of Leonard Refineries, Inc., at Alma, Mich., was described by the Journal's refining editor in the August 16, 1947, issue. Here is the story of the unit's first "turnaround."

The Journal's follow-up article brings "close-up" photos of important turnaround operations and time breakdowns.

THE first turnaround of the Leonard T.C.C. unit has recently been completed with an expenditure of only 4,557 man hours. This followed an initial run of 222 days, during which time the unit had an on-stream efficiency of 96.4 per cent.

Complete inspection of the plant was begun on October 27, 1947. Using only 40 men per day (two crews of 20 men each), work of the turnaround was completed in 10½ days. Of the 40 men used, 29 were from the refinery-maintenance force and 11 from the operating personnel of the unit. Operation of the plant was resumed on November 6, 1947.

During the initial run several interruptions of short duration in the operation of the plant occurred. A complete itemization of all off-stream periods and causes thereof is presented in Table 1. The off-stream periods were of a minor nature. Out of a total elapsed time of almost 8 months, only 116 hours of off-stream time were attributable to the catalytic section.

Turnaround Summary

To expedite the turnaround, a well-defined program of inspection was arranged prior to the shutdown. Through conferences held at the refinery, Houdry and Leonard representatives scheduled the shutdown procedure and sequence of activities.

Charge to the plant since initial

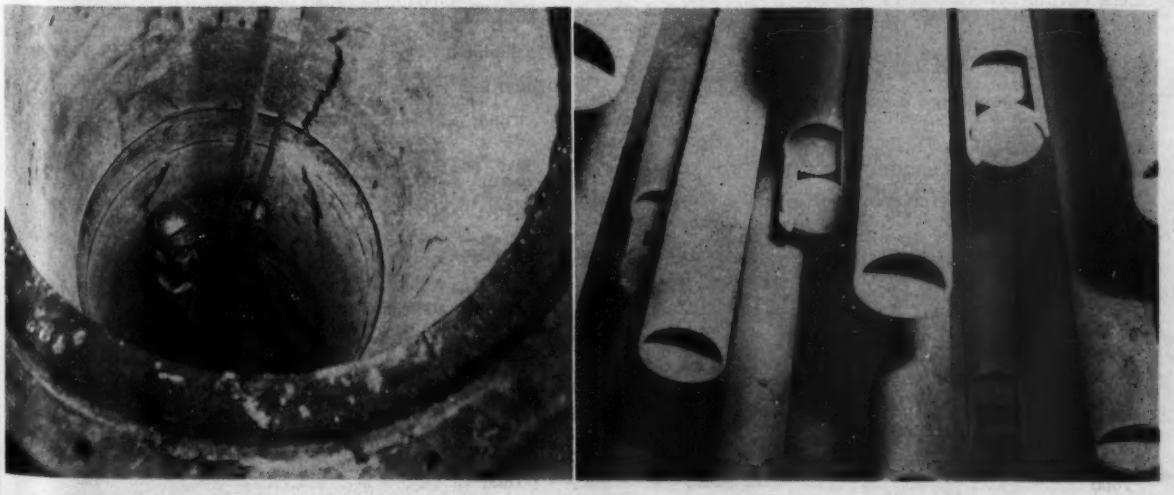
Illustrations of excellent internal condition of regeneration kilns. At left appears a portion of the internal wall insulation and flue-gas collector channel assembly in bottom zone of kiln. At right is a view of air-inlet distributor-channel assembly and water-cooling coils in an intermediate zone of kiln. A few panels of wall insulation in the kiln showed a slight amount of erosion, which were repaired with the field application of Panelclad. No mechanical repairs were required on any of the air-inlet distributing channels, flue-gas collecting channels, or water-cooling coils of kiln

operation in March 1947 has consisted principally of Reed City and Adams reduced crudes which have sulfur contents of about 0.9 weight per cent. After being preheated to approximately 840° F. in vaporizing heaters, the reduced crude charge is flashed in a tar separator to produce a tar separator overhead vaporized charge for the catalytic reactor, and a heavy bottoms product which is subsequently processed into asphalt and heavy-fuel-oil components.

The overhead and bottoms products from the tar separator flash have average sulfur contents of 0.6 and 1.1 weight per cent respectively. Thus

Right: Catalyst elevator. The new split bucket-type elevator fulfilled all expectations by functioning satisfactorily throughout the 222-day run. Inspection and adjustment of elevator during turnaround required only 75 man hours. Photo shows elevator chain assembly passing overhead shaft at top of structure. Baffles in foreground are means by which regenerated and spent-catalyst contents of each bucket are diverted to kiln and reactor hoppers. Total elongation of chain during 6 months of operation was only 4 in. Chain knuckles, which contact with traction rims, showed an average loss of metal of about .06 in. and traction rims themselves had lost only 0.17 in. of thickness

Below, left: Catalyst lines. All these, to and from kiln, were thoroughly inspected for possible loss of metal due to erosion and found to be in perfect condition. Likewise, all air and flue-gas lines to and from kiln were inspected to determine condition of internal insulation. Again no repair was required since insulation was found intact throughout. Photo shows a section of the air-inlet manifold to kiln. Below, right: T.C.C. reactor. This was also thoroughly inspected for mechanical defects. Measurements indicated no loss of metal from reactor shell or internal metal elements from either erosion or corrosion. All reactor parts were fabricated of carbon steel. Picture shows a typical portion of vapor and catalyst tubes of the disengager in bottom of reactor



the sulfur content of the reduced crude charge and fractions thereof have been sufficiently high that some corrosion of processing equipment was anticipated from this source. Results of the recently completed inspection indicates that only a minimum use of alloy steel for protection against corrosion is necessary for continued satisfactory performance of the plant.

The turnaround comprised a complete inspection of all items of equipment in the T.C.C. plant—from charge pump to final stabilizer in the gas plant. Pertinent data concerning the man-hour requirements for the shutdown work are presented in Tables 2, 3, 4, and 5. Out of a total of 4,557 man hours, 2,954 were spent in the inspection and maintenance of conventional refinery equipment, with only 425 on the catalytic section. Because of the excellent mechanical condition of the unit, the major portion of the work was accomplished with unskilled labor. (Table 3).

Actualy, two of the items of work performed during the shutdown do not come under the category of inspection and repair since they involved changes in equipment design for new processing schemes. These were piping changes in the steam-superheater section of the vaporizing heaters and installation of liquid-feed apparatus in the T.C.C. reactor. With recent reduced crude-charge rates to the vaporizing heaters twice that for which the equipment was originally designed, it was found that there was an excess of steam-superheating capacity in the heaters. Therefore, during the shutdown half of the steam-superheating coils were connected in series with the convection section reduced crude coils to increase heat input to the charge, and at the same time reduce the steam-superheating surface to the desired amount.

The liquid-feed apparatus, which required slight modification of the reactor internals, was installed to permit future processing of non-vaporizable stocks in the T.C.C. unit. For example, in the near future it will be possible to charge to the T.C.C. reactor the overhead product from the vacuum flashing of the tar separator bottoms stream.

The man-hours required for the two design changes amounted to 496. Therefore, the grand total man-hours expended during the turnaround was 5,053, 4,557 for inspection and repairs and 496 for design changes.

Auxiliary Equipment

The three largest items of repair during the turnaround were the renewal of sections of the transfer lines between the heaters and tar separator, the renewal of the hot-tar lines from the bottom of the tar separator, and the cleaning and adjusting of the wet-gas compressors in the gas plant.

In the original design study it was recognized that the sulfur content of the charging stocks might be high enough to necessitate use of alloy steel construction in many parts of the system. However, a decision was reached at that time to use carbon steel in several places and determine by experience those critical points where the use of alloy stel was necessary. As previously mentioned, the results of this inspection were gratifying in that severe corrosion was found to have occurred in only the heater transfer lines and tar separator bottom lines. During the turnaround, these lines were replaced with 4-6 per cent chrome alloy steel pipe. These lines operated within the critical temperature range for corrosion by the plant charging stocks. For example, the return line from the tar-quench cooler to the tar separator showed no corrosion whereas the other tar lines which operate above 600° F. were severely corroded.

The wet-gas compressors required thorough cleaning of both the power and compression sides. There were heavy sulfurous deposits on the suction valves of the compression cylinders from the hydrogen sulfide content of the gas processed. A large percentage of the 912 man hours charged by machinists during the

(Continued on page 116)

TABLE 1—ON-STREAM EFFICIENCY SUMMARY

Cause of off-stream time—	Hours	Per cent
Stabilizer cleanup	48.0	25.1
Blower maintenance	41.3	21.6
Circulating water pump failure	63.7	33.4
Power failures	26.7	14.0
Clay holdup in reactor seal leg	11.3	5.9
Total	191.0	100.0
Total hours on stream 3-18-47 to 10-27-47	5,140.2	....
Total hours elapsed, 3-18-47 to 10-27-47	5,331.2	....
On-stream efficiency	.....	96.4

TABLE 2—MAN HOUR REQUIREMENT FOR TOTAL PLANT, BY JOB ITEMS

Job item—	Man hours	Per cent
Turnaround:		
Inspection and adjustments to catalyst elevator	75	1.7
Miscellaneous work on kiln and reactor	350	7.7
Sandblasting gas and water separator	285	6.3
Painting inside gas and water separator	48	1.1
Replacement of tar separator bottoms lines	501	11.1
Replacement of heater transfer lines	344	7.5
Miscellaneous work on valves, pumps, instruments, electrical equipment, gas compressors, heat exchangers, coolers, fractionating towers, etc.	2,954	64.6
Subtotal	4,557	100.0
New installation and revisions:		
Liquid feed installation	275	....
Steam-superheater piping changes	221	....
Total	5,053	....

TABLE 3—MAN HOUR REQUIREMENT FOR TOTAL PLANT, BY CRAFTS

Craft—	Man hours	Per cent
Turnaround:		
Welders	200	4.4
Machinists	912	19.9
Instrumentation and electrical	216	4.8
General labor	3,229	70.9
Subtotal	4,557	100.0
New installation and revision:		
Welders	302	....
Machinists	40	....
Instrumentation and electrical	4	....
General labor	150	....
Total	5,053	....

TABLE 4—MAN HOUR REQUIREMENT FOR CATALYTIC SECTION, BY JOB ITEMS

Job item—	Man hours	Per cent
Turnaround:		
Unheading and heading vessels, etc.	144	33.9
Elevator inspection and adjustment	75	17.6
Reactor cleanup	72	16.9
Repairing flue gas compressor	30	7.1
Instrument and electrical maintenance	24	5.6
Circulating water-pump inspection and repair	18	4.2
Kiln insulation	16	3.8
Steam drum cleanup	12	2.8
Kiln cleanup	10	2.4
Makeup water pump repair	8	1.9
Miscellaneous	16	3.8
Subtotal	425	100.0
Liquid feed installation	275	....
Total	700	....

TABLE 5—MAN HOUR REQUIREMENT FOR CATALYTIC SECTION, BY CRAFTS

Craft—	Man hours	Per cent
Turnaround:		
Welders	38	9.0
Machinists	85	20.0
Instrumentation and electrical	24	5.6
General labor	278	65.4
Subtotal	425	100.0
Liquid feed installation:		
Welders	180	....
Machinists	36	....
General labor	59	....
Total	700	....

PETROLEUM ENGINEERING SCHOOLS

NO. 13 IN A SERIES

MISSOURI SCHOOL OF MINES AND METALLURGY

Mining Building, half of which is used by School of Mines and Metallurgy

SALIENT FACTS AND FIGURES

General: Located in central Missouri at Rolla, 65 miles south of Jefferson City. School established 1870 by state legislature, is an integral part of University of Missouri. A land grant, coeducational institution, it is fundamentally an engineering school with special reference to branches of the mineral industry. Headquarters of the Missouri Geological Survey are in Rolla as are regional headquarters of the U. S. Bureau of Mines and the U. S. Geological Survey.

Buildings and grounds: Campus comprises 112 acres. Fourteen permanent buildings and 29 temporary structures presently are being used. An experimental mine property of about 10-acre expanse is situated 1½ miles from the campus.

Calendar: Two semesters (fall and spring) plus 8-week summer term.

Tuition and expenses: Tuition is free to residents of Missouri. For nonresidents, a tuition fee is fixed, on a reciprocal basis, to the same amount as a resident of Missouri would be charged in attending a similar institution in the nonresident's own state. General fees for all students total about $60 a semester.

Left: J. D. Forrester, professor and chairman of the department of mining

Right: F. A. Graser, associate professor of petroleum engineering

PETROLEUM engineering at Missouri School of Mines and Metallurgy has been offered as an optional curriculum of the department of mining since 1922. Dr. Curtis L. Wilson is dean, Dr. J. D. Forrester is chairman of the department of mining, F. A. Graser is associate professor of petroleum engineering, and R. A. Eck serves as an instructor.

The staff has had many years of field experience. Professor Graser, a graduate of University of California, has been in engineering practice in the petroleum industry since 1924, serving as a consulting engineer in California and other fields. Eck is a graduate in petroleum engineering at Missouri Mines and is completing work for a master's degree in reservoir mechanics.

Total enrollment for 1947-48 is 2,769 students. This may be compared with the previous all-time high enrollment that existed in 1942-43 when the number of students in school was 958. Enrollment in petroleum engineering for the above periods comprises 133 and 36, respectively. By classes, the registration is as follows:

	1942-43	1947-48
Freshman	5	21
Sophomore	7	55
Junior	8	38
Senior	16	18
Graduate	0	1

Freshman registration given above should not be considered as fully indicative of interest, however, as the

View in display room, Mining Building, showing display of petroleum equipment

View in petroleum-engineering laboratory of the Mining Building

school operates on a "common freshman year plan" and many freshmen do not elect a specific field of study until they become sophomores. One hundred fifty full-time faculty members are employed as instructors of the present student body.

Laboratory facilities for petroleum engineering include all fundamental equipment used in determining the physical properties of oils, chemical and physical characteristics of muds, bottom-hole pressures, core measurements, well logging, and natural gas flow and meter measurements. A display room is maintained in which sucker-rod equipment, well-drilling equipment, and working models of apparatus used in well completion are demonstrated.

Course of Study

The course of study required of students majoring in petroleum engineering is accredited by the E.C.P.D. and includes the following technical subjects: petroleum industry fundamentals (3 credits), petroleum production methods, development (3 credits), petroleum engineering laboratory analysis (3 credits), petroleum production engineering, exploitation (3 credits), petroleum production engineering, reservoir mechanics (4 credits), petroleum engineering design (3 credits), petroleum valuation and economics (2 credits), natural gas engineering (4 credits). In addition, basic science and engineering subjects must be taken as well as at least four semesters of English and two semesters of economics or other humanities subjects.

One summer must be spent in field practice before undergraduate work is considered complete and various supervised inspection trips to field operations are required, particularly in the senior year. Four academic years (158 credits) are necessary for completion of work for a B.S. degree. The average salary of the graduates of 1946 on entering industry was $275. The starting salary of men beginning work as petroleum engineers in 1941 was approximately $225 a month.

Research and graduate studies in petroleum engineering are encouraged at Missouri School of Mines and Metallurgy. Several aids to do research are maintained in the form of fellowships and graduate assistantships. These generally pay $850 for the academic year and are subject to renewal. Shell Union Oil Corp. maintains a fellowship for studies in production engineering. Total stipend amounts to approximately $1,500 a year.

Chapters of the American Institute of Mining Engineers, Tau Beta Pi, Phi Kappa Phi, Theta Tau, and the Society of Sigma Xi are on the campus.

Petroleum refining is established as an optional curriculum in chemical engineering. Dr. W. T. Schrenk is chairman of the department. The work in petroleum refining is integrated with that of other departments on the campus, and in 1947-48, 14 men were majoring in this field. In 1942-43 the enrollment totaled 5 students.

T. C. C. Unit Turnaround

(Continued from page 114)

turnaround was due to the maintenance required on the gas compressors.

Inspection of the gas-and-water separator tank revealed a slight pitting on those portions of the shell which are in contact with the water layer. This circumstance was corrected by sand blasting the lower half of the horizontal 10 by 40-ft. separator and coating it with a protective plastic paint. This equipment is considered to be the most unconventional of the plant. Instead of passing the overhead vapors from the synthetic crude tower through conventional shell-and-tube condensers, a direct-contact, barometric-type condenser is used. Cooling water and hydrocarbon streams are discharged into a tank where separation of the condensed gasoline and water takes place. Inspection of this equipment indicated that a large amount of maintenance, material, and labor was saved over that which would have been expended with the regular-type shell-and-tube condensers. Based upon the experience of other refiners, the amount of hydrogen sulfide in the overhead vapors would probably have necessitated retubing the bundles after 8 months' operation. At the present time, it is fully expected that the barometric-type condenser and the separator tank will last the life of the unit and require only very minor repairs.

All of the fractionating towers in the plant were inspected and found to be in good condition. For example, there was practically no coke or catalyst fines in the bottom of the synthetic crude tower. This fact speaks well for the efficiency of the catalyst-vapor disengager in the bottom of the reactor since, for extended periods during the initial run, the charge rates to the reactor were considerably in excess of that for which the equipment was originally designed. Acidizing of the absorber was the only tower maintenance performed during the turnaround.

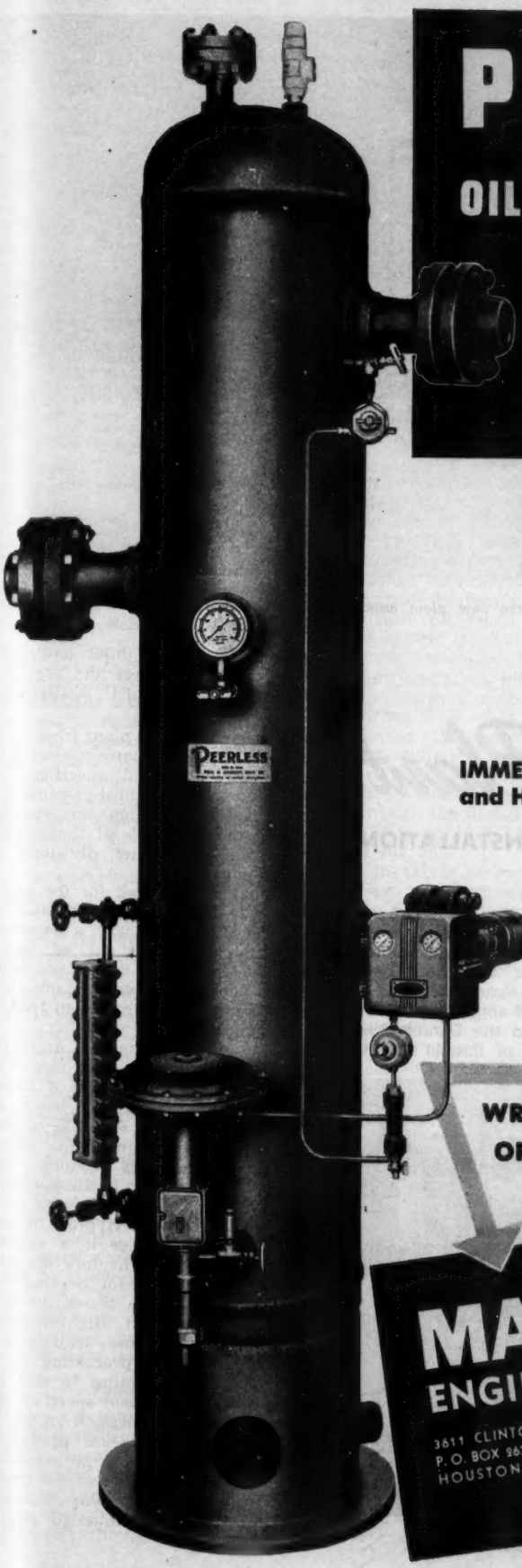
All coolers and heat exchangers were opened, inspected, and where necessary, cleaned. There was not an excessive amount of fouling in any exchanger. The circulating quench exchangers were free of any deposits of catalyst fines. The water sides of all water coolers were acidized.

A nominal amount of pump maintenance was required. Serious corrosion, similar to that which occurred in the hot-tar lines, had also occurred in the hot-tar pump, necessitating the replacement of fittings in its liquid end. Other pumps required routine servicing and some, because of their good performance during the initial run, were not even opened for inspection.

There was essentially no instrument maintenance required during the turnaround. The tabulated data show a total of 220 man hours for instrument servicing, of which a large percentage was expended in replacing orifice plates in the plant to accommodate the higher charge rates which have been and will be maintained.

Sinclair Refining Closes Office in Bartlesville

Sinclair Refining Co. has closed the Bartlesville, Okla., office of its pipeline department after 45 years of continuous operation. Work of the Bartlesville office is to be handled through the company's main offices in Independence, Mo.



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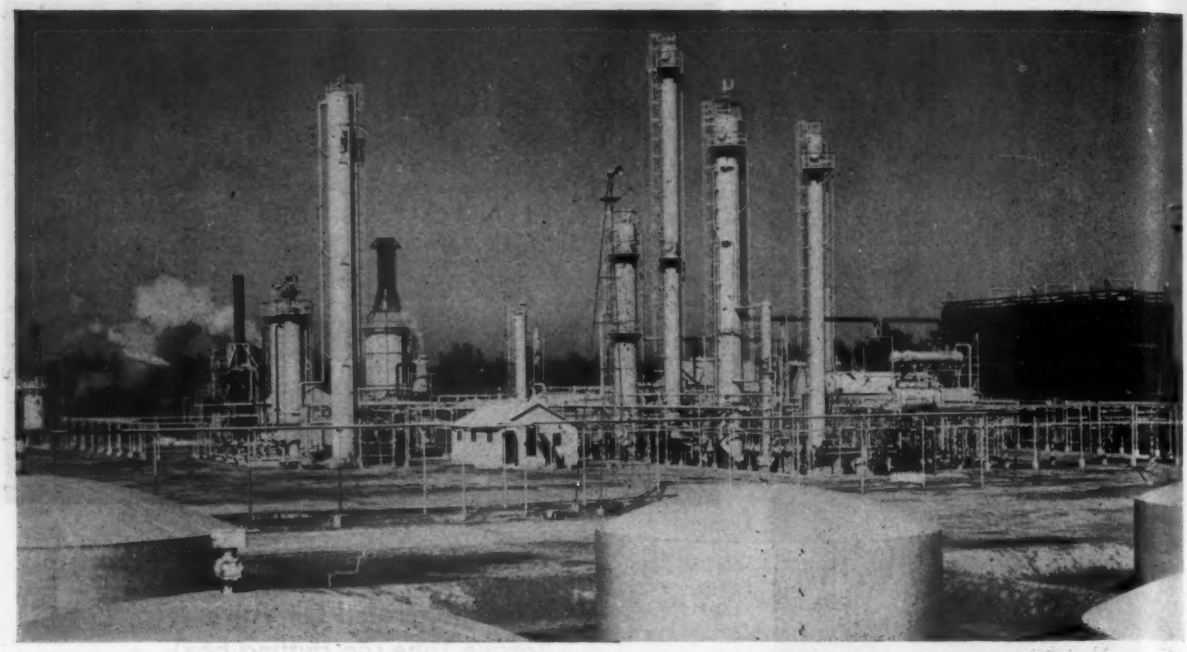


Located in the huge Carthage (Texas) gas field, the new plant handles 100 million feet per day

ARKANSAS FUEL OIL CO. COMPLETES

Panola Gasoline Plant

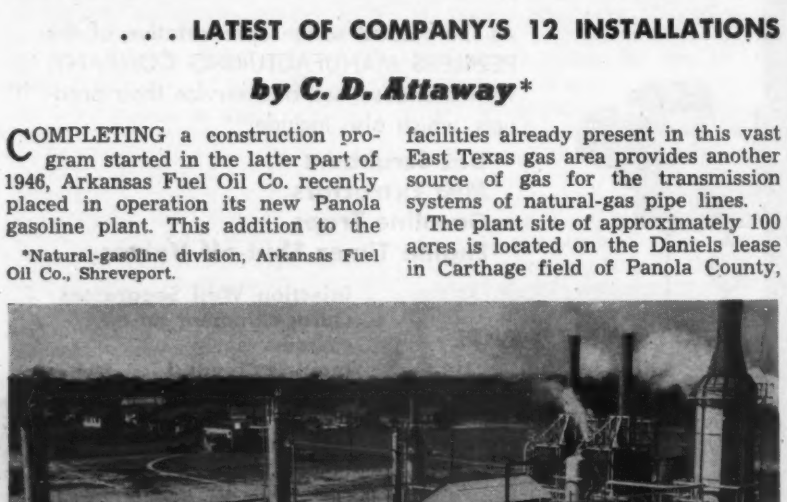
. . . LATEST OF COMPANY'S 12 INSTALLATIONS

by C. D. Attaway*

COMPLETING a construction program started in the latter part of 1946, Arkansas Fuel Oil Co. recently placed in operation its new Panola gasoline plant. This addition to the facilities already present in this vast East Texas gas area provides another source of gas for the transmission systems of natural-gas pipe lines.

The plant site of approximately 100 acres is located on the Daniels lease in Carthage field of Panola County, Texas. It is about 8 miles southwest of the city of Carthage and approximately 4 miles west of U. S. Highway 59.

*Natural-gasoline division, Arkansas Fuel Oil Co., Shreveport.

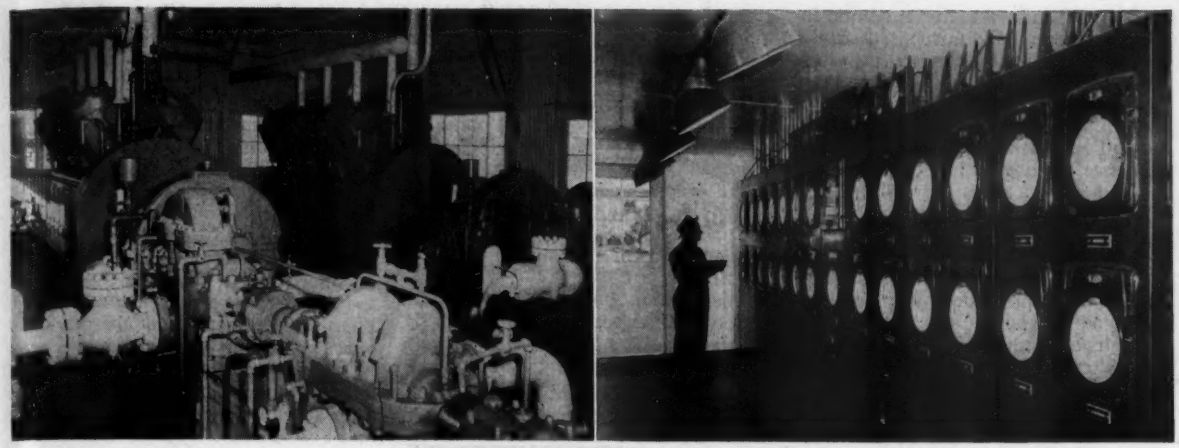


Portion of plant yard. Design features overhead piping

Engineering of this plant from start to finish was a company project. All plans, drawings, and specifications originated in the natural-gasoline division, and construction was carried on with the assistance of the service department and other divisions of the company.

Original plans called for the plant to provide for a processing capacity of 50,000 M.c.f. daily with a potential production of 65,000 gal. of liquid products. Changes in design and field development, however, demanded that this capacity be raised to 100,000 M.c.f. daily.

At the present time gas from 28 wells, many of them dually completed, is being delivered through a 12-in. field pipe-line gathering system of Arkansas Louisiana Gas Co. under 1,050 lb. pressure into the plant. Majority of the wells' produce from the upper and lower Pettit between 5,700-6,000 ft. This gas contains considerable water vapor. Hydrate formation at high pressures is a special problem. Numerous heaters are required on field lines for heating the gas to a temperature above the hydrate formation point. High-pressure separators and scrubbers trap incoming condensate for processing in a fractionating unit similar to that of refinery design. Several specification products such as absorption oil, kerosine, and diesel fuel are produced. Other plant equipment is available for the manufacture of various products such as motor gasoline, butane, propane, and other liquefied petroleum products.



Interior views of pump house (tandem-drive centrifugals), and instrument room

Dehydration

The plant operates on an inlet pressure of 1,050 lb. and the incoming wet gas first enters a 5½ by 80-ft. absorber containing 30 trays. From the outlet of the absorber the gas is delivered into one of the plant's two 4½ by 33-ft. dehydrator towers which are packed with activated bauxite desiccant. About 10 per cent of the inlet gas is diverted for use as a regenerating medium. This regenerating gas is passed through a heater and the temperature raised to about 400° F. It is there charged into the bottom of the offstream dehydrator tower and passes upward through the desiccant beds to raise the temperature and release the adsorbed water. This provides for one dehydrator tower to be in operation while the other is being regenerated.

Wet gas from the regenerating dehydrator is passed through two 58-tube atmospheric coolers having two passes and 303 sq. ft. of surface each. These coolers are located in the first bay of the cooling-tower basin.

The cooling tower is a Hudson design with induced draft having three cooling cells. Each cell has a 10-ft. horizontal fan mounted at the top and driven by individual steam turbines. This redwood structure is approximately 40 ft. high, 23 ft. wide, and 120 ft. long and has 20 cooling sections or bays.

The cooled gas next enters a 2 by 14-ft. vertical scrubber where the condensed water is removed, and may then be delivered into the dehydrator stream or the pipe line direct, depending upon its dewpoint and the water-vapor content of the main stream from the dehydrators.

Vapor Recovery

Rich oil trapped from the bottom of the absorber passes into a 6 by 40-ft. horizontal flash tank upon which is mounted a high-pressure reabsorber, and the flashed vapors resulting from the pressure drop to 400 lb. are stripped through this reabsorber tower and pass into the fuel or residue system. Condensate trapped in the plant inlet separators flows into a 4 by 20-ft. horizontal surge tank operating at 400 lb. and the vapors flashed here as charged into the high-pressure reabsorber.

Rich oil from the high-pressure flash tank is accumulated in an 8 by 40-ft. horizontal low-pressure surge tank and traps into the bottom of a low-pressure reabsorber. This reabsorber is a 42-in. by 35-ft. column having 16 trays and operating at approximately 85 lb. This vessel also processes the vapors released when the condensate which has passed through the flash tank is trapped into a 36-in. by 20-ft. surge tank operating at 100 lb.

In this manner a complete flash-vapor recovery is maintained and the gas stripped thoroughly before passing into the plant fuel system.

Still and Rectifier

All enriched oil is then picked up from the bottom of the low-pressure reabsorber by a turbine-driven centrifugal pump and sent through a bank of four shell-and-tube exchangers, passing counter current with the lean oil from the still. From the exchangers the rich oil passes on to a direct-fired heater and is raised in temperature to 600° F.

Out of the heater, the oil enters a 36-in. by 10-ft. disengaging drum and then flows into a system whereby it can be controlled through preheaters and reboilers on various columns such as the fractionater, stripper, and debutanizer for heat exchange instead of the conventional steam. After this extra service the oil is eventually passed into a 6 by 54-ft. split flow still and rectifier having 20 trays and operating at approximately 100 lb. The overhead from this column is condensed through two shell-and-tube water-cooled condensers and accumulated in a horizontal reflux tank. A centrifugal pump refluxes the still and all wet overhead vapors still uncondensed enter a bank of two three-pass atmospheric condensers located in the center bays of the cooling-tower basin, and all net overhead vapors are condensed.

From here the condensed raw feed products pass into a 10 by 40-ft. raw-products surge tank on top of which is mounted a 24-in. by 20-ft. contactor operating at 90 lb. Stabilized distillate

High-pressure inlet scrubbers and tank farm

is used as an absorbing medium in this contactor. Any purchased crude or condensate is also charged into this vessel and the overhead vapors pass back into the low-pressure reabsorber.

From the bottom of the contactor the oil is picked up by a close-clearance reciprocating pump and charged into a 48-in. by 93-ft. debutanizer column. This vessel has 48 trays and operates at about 260 lb. The charge is preheated through an oil-heated exchanger and enters the column near the middle tray section. Overhead vapors are condensed through a bank of two three-pass atmospheric coolers located in the fourteenth and fifteenth bays of the cooling-tower basin.

This condensed fluid is accumulated in a 6 by 20-ft. horizontal accumulator tank where an 8 by 7 by 6 pump performs reflux service. Out of this tank, the charge for the depropanizer is picked up by a 6 by 5 by 12 pump.

Depropanizer

The depropanizer charge is preheated by exchanging with hot bottoms and charged to a 48-in. by 83-ft. depropanizer column having 40 trays.

This column operates at 330 psig. with a reboiler temperature of 245° F. Overhead vapors are condensed in an atmospheric section and the condensate is accumulated in a 4 by 20-ft. horizontal reflux drum. Uncondensed vapors from this drum pass through a final atmospheric condenser and flow to a 48-in. by 20-ft. deethanizer feed accumulator. This stock is fed to the deethanizer for removal of ethane to produce specification propane. The bottoms from the depropanizer reboiler pass through an atmospheric cooler to butane storage.

Fractionator

The pentanes and heavier that are produced out of the 21-ft. reboiler on the debutanizer are preheated through another oil heated exchanger and charged into the gasoline fractionator, which is a 6 by 73-ft. vessel having 30 trays and operating at about 15 lb. Side cuts are taken here for kerosine and absorption oil.

All overhead from the fractionator is condensed through two shell-and-tube water-cooled condensers and collected in a 6 by 20-ft. accumulator. Feed is taken from this tank by a centrifugal pump for refluxing the column.

A residium recycle is maintained on the fractionator bottom by means of a 6 by 4 by 12 reciprocating pump which circulates the bottoms from the column through an oil-heated exchanger. Excess is passed into an atmospheric cooler in the cooling-tower basin and thence to storage as diesel fuel.

Side cuts of kerosine and absorption oil are processed in a 24-in. by 33-ft. stripper column which has the upper six trays separated for the kerosine section and the lower six trays for finishing absorption oil. Vapors from the top of each section are returned to the fractionator.

Out of the absorption-oil reboiler, the product goes to a four-pass atmospheric cooler and thence to storage. The kerosine production passes from its reboiler through an eight-pass atmospheric cooler and thence to storage. Both of these reboilers are equipped with Hancock flow-control valves on the hot-oil heating medium.

Deethanizer

Charge to the deethanizer is preheated through a shell-and-tube exchanger and into the 36-in. by 65-ft. column which has 24 trays and operates at about 525 lb. Overhead vapors enter a three-pass condenser located in the cooling-tower basin and the fluid is accumulated in a 24-in. by 20-ft. tank. Column reflux is maintained by a 5 by 5 by 12 pump. A reboiler on the column passes the butane-propane mixture into an eight-pass condenser and thence to storage.

Water for the operation of the many condensers is supplied to the system from the cooling tower by means of a turbine-driven centrifugal pump. The plant water supply is presently produced from two deep wells on the plant yard. These wells are equipped with vertical turbines driving centrifugal deep-well pumps having a capac-

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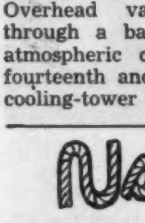

Fig. 179 Acme W.L. Knife Cutters.

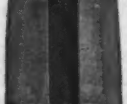

Fig. 180 Cover Plate

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ity of 150 g.p.m. Discharge from the water wells flows through a hydrogen-sodium zeolite treater and then through a decarbonator to storage.

Steam Plant

Plant steam supply is generated by two 36 hp. water-tube boilers operating at 250 lb. These boilers have turbine-driven induced-draft fans. Water supply is maintained in a 1,000-bbl. wooden tank. An elevated deaerating feed-water heater is furnished makeup by a 200 g.p.m. centrifugal pump. The boilers are fed from this heater by a turbine-driven centrifugal pump. Air cooled exhaust steam condensors are also being installed to permit 90 per cent return of condensate.

A feature of the plant is the use of aboveground and elevated piping in all units possible.

The plant also has a tetraethyl lead blending plant of the tank-car to 4,250-gal weigh-tank type. For this operation two 5,000-bbl. blending tanks with in-tank mixers have been erected. The unit is housed in a corrugated iron building 44 by 27 by 14 ft. adjacent to the railroad spur track and approximately 100 ft. from tank-car loading rack. An A.S.T.M. motor-method type C.F.R. knock-rating machine is located in the laboratory for running control of product specifications.

Loading Facilities

A modern steel loading rack having spot connections for 10 tank cars is located near the east side of the plant on a spur track of the Gulf Coast, Colorado, & Santa Fe Railway which runs adjacent to the plant. An adequate and convenient modern-type tank-truck loading dock and platform is also installed for handling local movements of plant production.

A five-room tile office and laboratory has been erected for the installation of the most modern testing and analyzing equipment, including one of the latest Podbielniak low-temperature fractional gas analyzers. Large and roomy offices are available for the plant supervisory personnel and communication with main offices are provided by a private telephone line direct to Shreveport, La.

An additional feature of the plant is a complete machine shop housed in a fabricated aluminum and frame building. Lathes, pipe threaders, drill presses, and other machine tools are installed for plant repairs and maintenance.

Storage

Adequate and complete storage of plant production and blending stock is provided by a variety of vessels and tanks. Two 5,000-bbl. Hortonspheres are available for raw condensate stock. Motor fuel is blended and stored in two 5,000-bbl. vertical tanks. Four 1,250-bbl. vertical tanks are in a battery for naphtha and kerosine production. An 8 by 30-ft. horizontal tank is used for naphtha rundown and a similar tank is provided for kerosine rundown. Two 10 by 40-ft. horizontal tanks handle gasoline rundown and a 10 by 15-ft. horizontal tank is used for diesel-fuel storage. A 7 by 28-ft. horizontal tank provides mineral seal storage.

Propane storage is provided by four 30,000-gal. horizontal tanks while butane production is stored in three 18,000-gal. and three 30,000-gal. horizontal tanks.

All storage area is neatly diked and properly equipped with fire walls. Piping is above ground and pumping equipment is centrally located for ease and convenience in handling movements.

Plant lighting is provided by two 62.5 kva. generators, one driven by a 95-hp. steam turbine and one driven by a gas engine. Elevated flood lights mounted on towers throughout the plant provide illumination for night operations.

Employe Housing

A total of 20 five-room cottages have been erected on a wooded section of the plant site for housing employes. These are compact homes about 24 ft. wide and 32 ft. long with a 6 by 12 front porch and a 10 by 20 screened back porch. All modern conveniences are installed.

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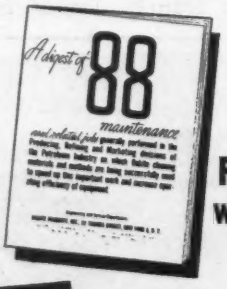

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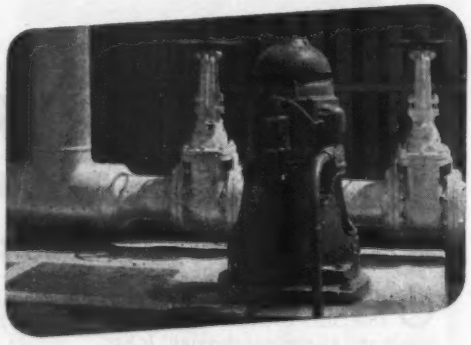

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Design of Tall Refinery Frames

(Continued from page 99)

moment computations for all portals in the bent are the same.

The other method of distributing wind shears and computing moments in the columns and girders may be described as "moment distribution by interrelated stiffnesses."

The assumptions employed in this method are:

(I) The points of counterflexure in columns only are at their midlength points.

(II) Wind shears are distributed in a bent according to stiffnesses of its columns. The K factor is I/L, provided column lengths are equal at the section under consideration; if not their K value = I/L.[3]

(III) Moment in the column above and below a joint which tends to rotate it, can be distributed to its girder framing by the stiffness factors K = I/L. Size of the members along line "B-B," Figs. 2 and 4, may be obtained as follows:

Columns = 12 in. WF—53 lb.

$I_{xx} = 426.2$ in.^{4}

and 14 in. WF—87 lb.

$I_{xx} = 966.9$ in.^{4}

Computations for K_c below the fourth floor level:

$$\frac{426.2}{120} = 3.55 \qquad \frac{966.9}{120} = 8.05$$

$$2\,(3.55) + 8.05 = 15.15$$

Since H = 5.4[8] (See Fig. 4-A)

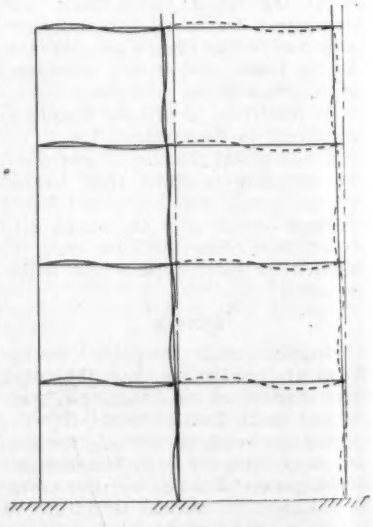

Fig. 8—(Phase II)

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$$\frac{3.55}{15.15} \times 5.4 = 1.26^k$$

$$\frac{8.05}{15.15} \times 5.4 = 2.9^k$$

Above the fourth floor level the computations for K_c is:

Columns = 12 in. WF—45 lb.;
$I_{xx} = 350.8$ in.^{3}

$$\frac{350.8}{120} = 2.93$$

and 14 in. WF—78 lb.; $I_{xx} = 851.2$ in.^{3}

$$\frac{851.2}{120} = 7.08$$

$$2\ (2.93) + 7.08 = 12.94$$

Since $H = 4.6^k$ (See Fig. 4-A)

$$\frac{2.93}{12.94} \times 4.6 = 1.04^k$$

$$\frac{7.08}{12.94} \times 4.6 = 2.52^k$$

By a previous assumption wherein

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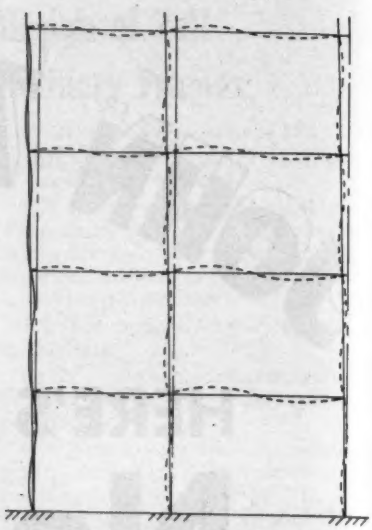


Fig. 9—(Phase III)

moments may be set up to satisfy $\Sigma M = 0$, their values about the windward and leeward columns are then $1.04^k \times 5 + 1.26^k \times 5 = 11.5'^k$. Therefore, the total moment induced in the girders framing into the windward and leeward columns at the fourth floor is -11.5^k.

In the interior column $M = 2.52^k \times 5 + 2.9^k \times 5 = +27.1'^k$ which value may be distributed to the adjacent girders framing into the column according to their respective K values.

Assume the girder sections to have the same I values and denoting the 12 ft. girder I value as I_1 and the 15 ft. girder as I_2 the computation proceeds thus:

$$\frac{I_1}{144} + \frac{I_2}{180} = \Sigma K$$

since both I_1 and I_2 are equal, K_c can be expressed as

$$\frac{1}{144} + \frac{1}{180} = .324$$

$$\frac{.0144}{.0324} \times 27.1^k$$

$$= 12'^k \text{ in } I_1 \quad \frac{.0180}{.0324} \times 27.1^k = 15.1'^k \text{ in } I_2$$

$$\Sigma M = +(12) + (15.1) - (12.6) - (14.5) = 0$$

Considering the advantages and disadvantages of the portal and the moment distribution by interrelated stiffnesses methods, the portal method shows the advantages: (1) size of members do not have to be determined; (2) by the law of statics, stresses resulting in desired moments may be computed throughout the frame.

The disadvantages of the portal method are: (1) where the frame is

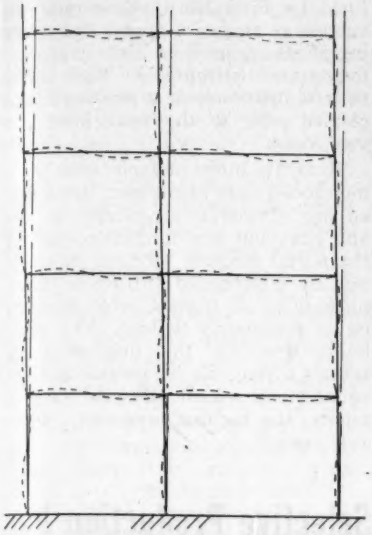
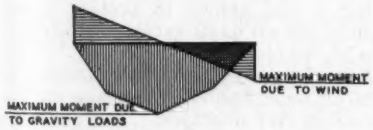


Fig. 10—(Phase IV)

unsymmetrical such that the assumptions would not satisfy the simple laws of statics. An illustration of this would be, for example: unequal column lengths. (2) Where the frame is entirely welded.

If the frame were all welded, the portal method could only be used as a tentative analysis to determine the size of members, and should not be used for final analysis.

Moment distribution by interrelated stiffnesses method has only one disadvantage, namely, the sizes of the members have to be determined. Many designers first determine the size of the members by gravity loads alone, and make allowances for the lowermost members which they feel may be affected by wind. The accompanying figure illustrates a moment curve of a case involving gravity and wind loading.



Since most construction codes permit unit stresses to be increased 1.33 of the allowable limit for wind only, there certainly is a reasonable margin before the wind-moment curve governs the girder size. Obviously, columns should be designed for direct stress and bending. Increase in allowable stress for bending is also permitted by code rules.

The designer should bear in mind that moment connections and splices must be designed properly for conditions of loading. A typical moment connection is shown in Fig. 6.

Another method which would apply to a frame undergoing phases of deformation is the moment distribution method as originated and out-

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lined by Prof. Hardy Cross wherein successive stages of fixing and rotating joints are used. In each stage, moments are distributed by their interrelated stiffnesses at a joint and then carried over to the next joint and vice versa.

There are other methods than those mentioned here. However, those given are comparatively simple to use and have but one limitation, that of the portal method. Moment distribution by interrelated stiffnesses is applicable to all frames, rivet connected or completely welded. The same holds true for the unsymmetrical frames where column lengths are unequal along a bent. Despite its simplicity, the method produces reasonable results.

Selective Production by Alternate Layer Method

(Continued from page 110)

ceded by a series of experiments on the behavior of various drilling muds applied under pressure to gravel and sand-gravel packs. Preliminary tests were made with the pressure cell shown in Fig. 5. Selected drilling muds were introduced at the top of the gravel layer and gas pressures up to 2,100 psi. were applied to the mud column. Backflow was obtained by water presure.

Table 1 shows the conditions and results obtained using several muds. The downward flow of mud filtrate in all cases ceased within 30 minutes after initial pressure was applied, and no further flow occurred during the pressure periods which ranged from 5 to 13 days. The amount of filtrate passing the sand-gravel layer was not measured accurately during the first 30 minutes of pressure application, but it was known to average about 20 cc. for all muds except the oil-base mud, where about 750 cc. of filtrate flowed through before the formation of an impermeable filter cake on the sand-gravel interface.

Backflow started immediately at the indicated pressures. The rate of backflow was measured after 700 cc. of water had passed the cell. This does not, however, represent the ultimate flow rate.

Equipment used for testing the alternate-layer method on a larger scale is illustrated in Fig. 6. A 25-ft. hole was drilled in a Bee County gas-distillate field, and a joint of 10¾-in. casing was set on bottom. A 30-ft. joint of 7-in. casing, bull plugged at the bottom, was then set inside the 10¾-in. joint. Eleven ¼-in. pipe taps had been welded at intervals along the bottom half of the 7-in. casing (Fig. 9), and each tap was connected to the surface by a ¼-in. line. This provided a means of measuring or introducing pressure at any one of

11 points in the casing. A slotted 2-in. liner was set as shown and alternate layers dumped around it, using the same tools and methods later used in the field tests. An upper layer of sand was used instead of the sand and cement plug. The single cup-type packer assembly was then run inside the liner on a 1-in. line passing a packing gland at the surface. The annuli between 7-in. casing, blank liner, and tubing were filled with drilling fluid and subjected to 2,100 psi. from a nearby gas-distillate well. This pressure approximated that at the bottom of a 4,000-ft. column of weighted mud. By pressuring the various ¼-in. taps along the 7-in. casing it was possible to determine the level at which shutoff occurred at various packer positions inside the liner. Results verified expectations by showing gas flow into the liner through both types of layer below the packer, and complete shutoff of gas flow above the packer top. The double packer assembly was also tested, with similar shutoff both above and below the top and bottom packers, respectively.

Advantages

The advantages which are indicated as possible by the alternate-layer method of completion may be summarized as follows:

1. A more positive shutoff of water and gas may be obtained.
2. The producing level may be easily and economically changed from time to time as water or gas encroaches as a result of oil withdrawals.
3. Accurate measurements or accurate knowledge as to location of the gas-oil or oil-water contact is unnecessary. The optimum producing level may be determined after completion.
4. Segregated members within a producing zone may be alternately produced. For example, one zone may be produced until edge water cones in laterally. This zone may then be shut off and production withdrawn from another zone while the lateral cone in the first zone is subsiding. A material reduction in total water production should thereby result.
5. Sand production and the caving of shale is prevented. By proper choice of gravel size, sand production may be effectively prevented in any case with only slight restriction of fluid productivity.
6. Permanent plugging of any producing zone cannot result.
7. Vertical coning may be minimized or controlled.
8. Experience establishes that this type of liner and gravel pack may be more easily and cheaply removed than conventional liners and packers.

The economic gain anticipated by use of this type of completion is reflected in both the decreased cost of completion and the expectation of greater ultimate recovery. Economy is chiefly gained by eliminating the need for squeeze jobs and for coring and testing to determine the height of gas or water levels.

An increase in recovery should result from the ability to make a satisfactory completion in a thin oil section between gas and water horizons. This advantage applies as well to fields originally showing thick oil-producing sections, a factor frequently overlooked. It seems well indicated that the minimum distance from gas or water at which a successful completion, or recompletion may be made establishes the extent to which depletion may be carried in an oil column of any initial thickness if either gas or water drive predominates.

BOOKS

BEST'S SAFETY DIRECTORY. Published by Alfred M. Best Co., Inc., 75 Fulton Street, New York 7. 494 pp. $5.

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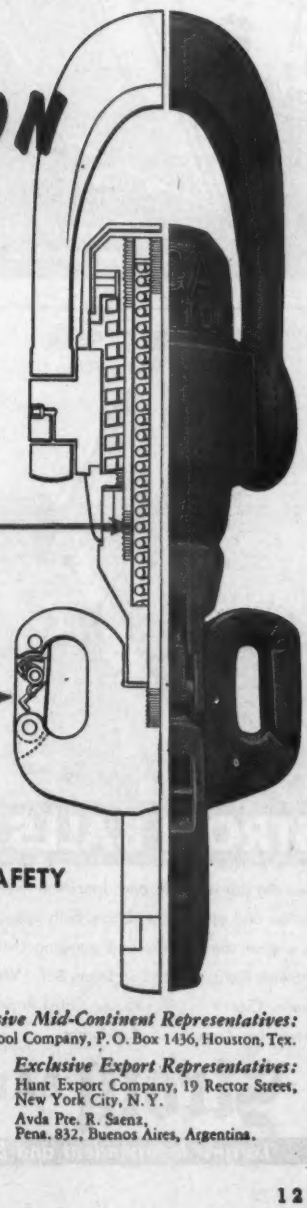

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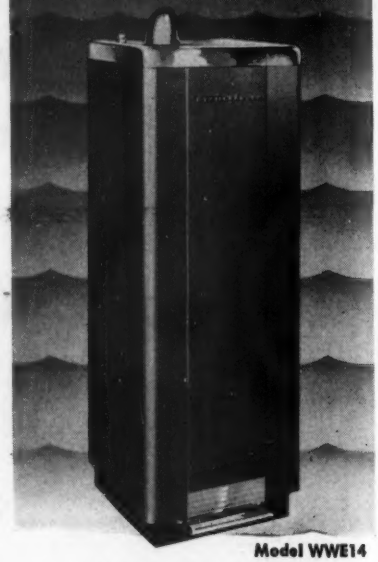

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Bit Weight and Rotating Speed

THE interrelationship of factors affecting the performance of a bit is particularly pronounced in case of speeds of rotation and of weight on bit, and the effect of these two factors on the results attained is of particularly importance. Much study has been devoted to this subject and there exist still considerable differences of opinions in the matter, particularly in case of speeds of rotation. About the only safe conclusion which may be drawn from experiments and tests would be a statement that design of the bit and experience gained in any particular area are the only safe criteria for selection of proper combinations of speeds and weights. For instance, extreme speeds of rotation of 500 r.p.m. or more which were successful in certain areas were tried and found unsatisfactory in other areas. This is true from the point of view of the bit service, disregarding the effect of the high rotational speeds on other elements of the rig.

In case of rock bits the rotational speed for the best performance of the bit is governed, among others, also by the bearings of the cutters. The capacity of the bearing used in the rock bits decreases with increase in speed of rotation and with decrease in size of bearings. This means that in case of rock bits there is a definite limit to the safe speed of rotation with heavy weights and a definite limit to the minimum diameter of the hole, which can be made with high rotational speed.

Sharpness of the bit is an important characteristic determining the safe weight which may be carried for most satisfactory results. As far as blade bits are concerned, too much weight on a sharp bit results in burying the bit blade too deeply in the formation, with resulting reduction in the cooling effect of the mud stream and rapid burning off of the cutting surfaces. In case of rock bits too large weight on a sharp bit drilling in a hard rock results in excessive tooth breakage. Gradual increase of the weight is needed as the bit dulls.

In the past few years successful techniques have been developed for improvement of bit performance in drilling extremely hard formations of the deep wells of the West Texas Permian basin. The technique includes relatively slow rotation of 50 to 60 r.p.m.; carrying of heavy weights, as much as 4,000 lb. per inch of bit, and concentration of the weight at the bottom, close to the bit, by use of multiple drill collars. This type of weight concentration prevents loss of the weight to the walls of the hole, which would take place if the weight were applied through drill pipe alone.

Experimental Studies

Rotational speeds and weights have important effect on deviation from the vertical of the hole made by the bit. This is a separate subject and is not here discussed.

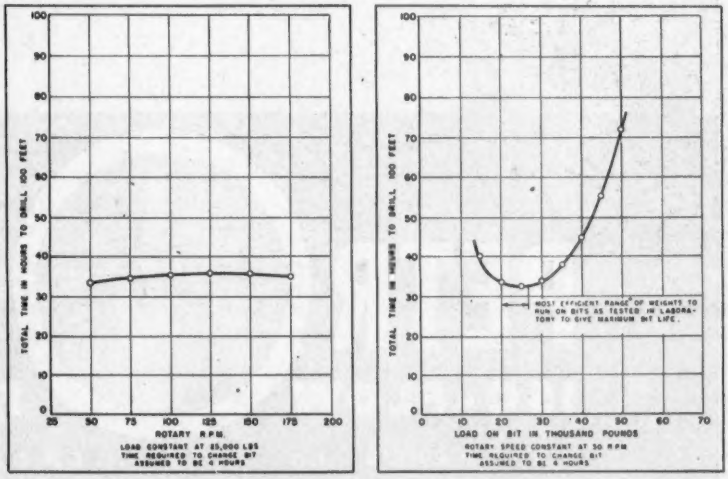
Results have been reported of interesting studies having as their purpose determination of the relative importance of effect on rate of penetration and on life of a rock bit, of variations in rotating speeds, and weights on bit.[1] It should be emphasized that the tests were performed on a rock of uniform hardness under laboratory conditions, and because of this fact the results of the tests cannot be generalized. However, the trend of results was sufficiently consistent to be of interest.

The experiments were arranged so that one of the two variables, weight or speed of rotation, was kept constant and the other was varied. The effects were then observed, (1) on rate of penetration for short drilling intervals, thus eliminating the factor of tooth wear, (2) on total penetration for the life of bit, and (3) on the rate of penetration for the life of bit. The results of these tests are summarized in the charts in Fig. 60.

The curve on the left shows that the time needed for drilling of the whole interval is not affected greatly by changes in the speed of rotation. This is because of the fact that, as shown by the tests, increase in speed of rotation tended to increase rates of penetration but decreased the total penetration for the life of the bit, with the two factors offsetting each other. The curve on the right shows that for the given set of conditions there exists a certain optimum weight on bit, resulting in a minimum of time needed for drilling of the interval.

Reference

1. Wiley B. Noble: "Fundamental Considerations in the Design of Rock Bits," The Oil and Gas Journal, October 18, 1947, p. 118.


TOTAL TIME IN HOURS TO DRILL 100 FEET
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LOAD CONSTANT AT 35,000 LBS
TIME REQUIRED TO CHANGE BIT ASSUMED TO BE 4 HOURS
LOAD ON BIT IN THOUSAND POUNDS
ROTARY SPEED CONSTANT AT 50 R.P.M.
TIME REQUIRED TO CHANGE BIT ASSUMED TO BE 4 HOURS
MOST EFFICIENT RANGE OF WEIGHTS TO RUN ON BITS AS TESTED IN LABORATORY TO GIVE MAXIMUM BIT LIFE.

Fig. 60—Effects of speed of rotation and weight on bit for the time needed for drilling a given depth interval with a rock bit[1]

No. 56 in a series by Joseph Zaba.

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PETRO-CHEM HEATER When Oleum's Unit 200, called a delayed coking unit, goes on stream early this fall, Union Oil Company will unveil one of the newest designs in petroleum processing heaters, the second one of its kind in service in the Bay Area.

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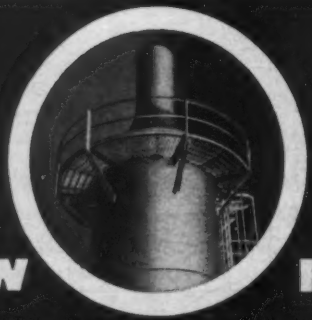

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The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Volume of Laboratory Fractions

TENTATIVE SCHEDULE OF TOPICS

Recent titles of The Refiner's Notebooks and ones immediately in prospect are:
No. 180—January 22, 1948—Steam Flow Through Orifices
No. 181—January 29, 1948—Pipe and Tubing (13⅜"-20")
No. 182—February 5, 1948—Pipe and Tubing (22"-60")
No. 183—February 12, 1948—Vapor Viscosity I
No. 184—February 19, 1948—Volume of Lab. Fractions
No. 185—February 26, 1948—Vapor Viscosity II
No. 186—March 4, 1948—Friction in Vapor Lines
No. 187—March 11, 1948—Friction in Condensers
No. 188—March 18, 1948—Threaded Pipe Joints

IN laboratory distillations the fractions or distillates are collected at a different temperature from that at which the still was charged. It is customary to convert the volume of the "charge" to 60° F. and therefore the fractions must be corrected to 60° F. or brought to a temperature of 60° F. The tabulation on this page shows the number of cubic centimeters to be added to or subtracted from 100-cc. fractions collected at various temperatures. The corrections can be applied to other sizes of fractions by ratio.

Temperatures below 60° F. are shown on the right side of the tabulation. The corrections are added if the temperature is below 60° F., and subtracted if the temperature is above 60° F. The standard coefficients of expansion of the U. S. Bureau of Standards were used in computing the corrections (Petroleum Refinery Engineering, second edition, page 118, McGraw-Hill Book Co., Inc., New York; Natl. Bur. Standards, Misc. Publ. 97, Circ. 154, and Tech. Paper 77).

Example—A 100-cc. fraction is collected at 118° F. and its gravity is about 49 A.P.I. Its volume at 60° F. will be 100—2.9 or 97.1 cc.

For temperatures above 60° F. subtract volume in Table
For temperatures below 60° F. add volume in Table

Temp. of fraction (°F.)	A.P.I. gravity of cut or fraction 0-15	15-35	35-51	51-65	65-79	Temp. of fraction (°F.)
60	0	0	0	0	0	60
62	.072	.08	.1	.12	.14	58
64	.144	.16	.2	.24	.28	56
66	.216	.24	.3	.36	.42	54
68	.288	.32	.4	.48	.56	52
70	.360	.40	.5	.60	.70	50
72	.432	.48	.6	.72	.84	48
74	.504	.56	.7	.84	.98	46
76	.576	.64	.8	.96	1.12	44
78	.648	.72	.9	1.08	1.26	42
80	.72	.80	1.0	1.20	1.40	40
82	.79	.88	1.1	1.32	1.54	38
84	.86	.96	1.2	1.44	1.68	36
86	.93	1.04	1.3	1.56	1.82	34
88	1.01	1.12	1.4	1.68	1.96	32
90	1.08	1.20	1.5	1.80	2.10	30
92	1.15	1.28	1.6	1.92	2.24	28
94	1.22	1.36	1.7	2.04	2.38	26
96	1.30	1.44	1.8	2.16	2.52	24
98	1.37	1.52	1.9	2.28	2.66	22
100	1.44	1.60	2.0	2.40	2.80	20
102	1.51	1.68	2.1	2.52	2.94	..
104	1.58	1.76	2.2	2.64	3.08	..
106	1.66	1.84	2.3	2.76	3.22	..
108	1.73	1.92	2.4	2.88	3.36	..
110	1.80	2.00	2.5	3.00	3.50	..
112	1.87	2.08	2.6	3.12	3.64	..
114	1.94	2.16	2.7	3.24	3.78	..
116	2.02	2.24	2.8	3.36	3.92	..
118	2.09	2.32	2.9	3.48	4.08	..
120	2.16	2.40	3.0	3.60	4.20	..
122	2.23	2.48	3.1	3.72	4.34	..
124	2.30	2.56	3.2	3.84	4.48	..
126	2.38	2.64	3.3	3.96	4.62	..
128	2.45	2.72	3.4	4.08	4.76	..
130	2.52	2.80	3.5	4.20	4.90	..
132	2.59	2.88	3.6	4.32	5.04	..
134	2.66	2.96	3.7	4.44	5.18	..
136	2.73	3.04	3.8	4.56	5.32	..
138	2.81	3.12	3.9	4.68	5.46	..
140	2.88	3.20	4.0	4.80	5.60	..
142	2.95	3.28	4.1	4.92	5.74	..
144	3.02	3.36	4.2	5.04	5.88	..
146	3.10	3.44	4.3	5.16	6.02	..
148	3.17	3.52	4.4	5.28	6.16	..
150	3.24	3.60	4.5	5.40	6.30	..

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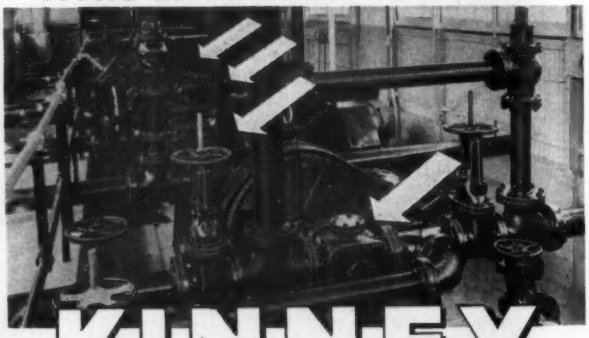

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ENGINEERING *fundamentals*

Effect of Connate Water on Relative Permeability Ratio

IN previous instalments the concepts of relative permeability and relative permeability ratio have been described. The relative permeability ratio is a measure of the transmission of one saturating fluid with respect to the transmission of another saturating fluid at a given saturation condition. Since most naturally occurring reservoirs contain three saturating fluids—oil, water, and gas—it is pertinent to inquire into the effect of the presence of the third fluid, water, upon the relative permeability ratio between the oil and the gas. Sufficient experiments have been reported in the literature to allow certain observations to be drawn.

In discussing relative permeability, the surface forces of the system must apparently be taken into consideration. For example, in considering the flow of oil and water through a capillary tube, the relative amounts of the two fluids flowing would obviously be dependent upon which fluid traveled along the walls of the tube and which flowed through the center, because the velocity of flow varies from zero at the wall of a capillary tube to a maximum in the center of the tube. In a reservoir material, the connate water is ordinarily the wetting substance. This water occupies the most inaccessible portions of the pore structure, the irregular portions of the channel wall, and those areas of finest pore structure. Therefore, the effect of the presence of water in these places so far as oil transmission is concerned is to occupy volume that would not contribute appreciably to flow in any case. This function has been noted recently in some published relative permeability curves.*

Buildup of Saturation

It was previously noted that one characteristic in a porous system flowing oil and gas was the buildup of a definite oil saturation before ony oil would flow. This volume occupied must be a volume which does not contribute very greatly to flow. In this respect, the amount of oil required can be regarded as being that necessary to fill up the same irregularities and small pore spaces that the connate water would fill. One might, therefore, anticipate the conclusion that an amount of wetting fluid, whether it be oil or water, up to an amount equal to the quantity of water which could be held in place without having water flow ensue, would affect very little the amount of oil flow at a specific gas saturation.

The gas phase, is in any instance, a nonwetting phase, and it has been determined experimentally that the amount of gas which will flow is dependent only on the amount of gas saturation. In other words, so far as gas flow is concerned, it is immaterial what may be the nature of the other fluids present so long as the gas continues nonwetting. Thus, the conclusion is reached that for a definite gas saturation, the flow of gas should be a constant, and if the water saturation is at a value below that value of saturation which initiates oil flow, the flow of oil should be essentially constant. Hence, the relative permeability ratio, k_g/k_o, should also be a constant under these conditions.

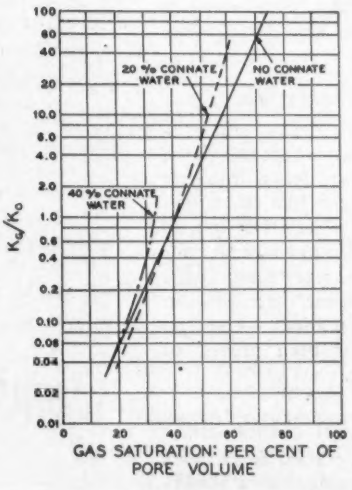

Fig. 1—Effect of connate water upon the k_g/k_o value

Reported experiments have verified this concept of behavior. Fig. 1 is a reproduction of data presented by Leverett.† In this instance when oil and gas were flowed in the absence of connate water, 20 per cent oil saturation was found necessary to initiate oil flow. With 20 per cent water in place of oil, Fig. 1 shows that these experimenters found that the k_g/k_o relationship is essentially unchanged in low-gas-saturation regions and deviates only slightly at higher gas saturations.

Oil Flow Would Decrease

At a connate-water saturation which is definitely above that oil saturation required to initiate oil flow, it could not be expected that the k_g/k_o relationship would remain unchanged. Although increased water content would not change the gas flow at a given gas saturation, it would decrease the amount of oil flow. Therefore, at a given gas saturation the ratio should be increased. In Fig. 1 the curve for 40 per cent connate water shows this characteristic with a considerably greater deviation than for the 20 per cent connate water.

This concept of no effect of connate water upon the position of the k_g/k_o curve allows a generalization of the analytical relationship reported in Engineering Fundamentals No. 320. There the following was noted:

$$k_g/k_o = ae^{-bS_o} \qquad (1)$$

Within that region of water saturation which has no effect upon the relative permeability relationship this can be generalized to read

$$k_g/k_o = ae^{-bS_t} \qquad (2)$$

where a and b are constants characteristic of the porous body and the fluids involved, S_o is the oil saturation, and S_t is the total fluid saturation.

*"Relative Permeability Measurements on Small Core Samples," Morse, Terwilliger, and Yuster, The Oil and Gas Journal, August 23, 1947, p. 109.

†"Steady Flow of Gas-Oil-Water Mixtures Through Unconsolidated Sand," Leverett and Lewis; A.I.M.E. Transactions, 1941 (Vol. 142) pp. 107 ff.

Series prepared by Dr. John C. Calhoun, Jr., Petroleum Engineering School, University of Oklahoma

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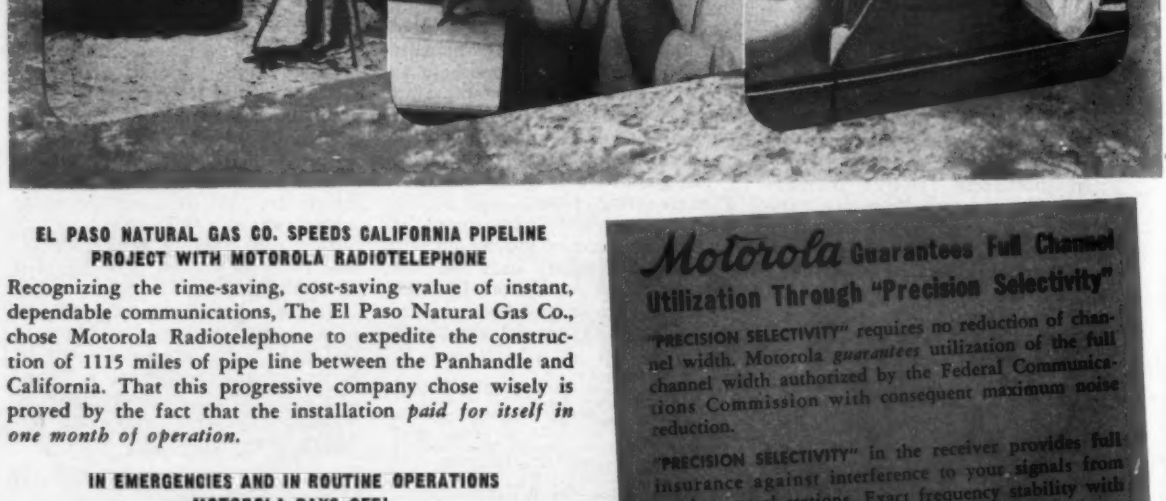

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NATURAL GAS

La Gloria Is Exempted From Natural Gas Act

CORPUS CHRISTI, Tex.—A favorable Federal Power Commission ruling has cleared the way for plans of La Gloria Corp. to supply part of Texas Eastern Transmission Corp.'s gas requirements from properties in Waskom field, Harrison County, East Texas.

The ruling was in a "status determination" which was requested by La Gloria to determine if it would be held a natural-gas company subject to FPC jurisdiction if it constructed gathering lines and other facilities.

Last December La Gloria acquired leases on about 5,000 acres of gas-producing property in Waskom field. It proposed to construct a gathering system and line extending about 25 miles to a connection with Texas Eastern's 24-in. main line, also in Harrison County. A plant is planned adjacent to Texas Eastern's line to process the gas for dehydration.

Before proceeding with the construction, La Gloria filed a petition asking FPC if it would be held a natural-gas company within the meaning of the Natural Gas Act as a result of these operations. The company pointed out its operations were wholly within the state of Texas and consisted of producing and plant operation. It said it would make other arrangements for the gathering of the gas if it were held a natural-gas company.

The company is expected to proceed in the near future with its plans for the project as a result of the FPC ruling that it would not come under the commission's jurisdiction.

Northern Natural Obtains FPC Authorization

The Federal Power Commission has authorized Northern Natural Gas Co. to construct facilities, estimated to cost $471,000, to enable it to deliver natural gas to Iowa Electric Light & Power Co. for resale and distribution in Marshalltown, Colo, and State Center, Iowa.

Conditions set forth by FPC included: (1) that Northern Natural not begin service to these towns until sufficient capacity above 390,000,000 cu. ft. daily be installed on Northern's system north of Clifton, Kans., and (2) the initial contract demand for service to the three cities does not exceed 500,000 cu. ft. daily.

Facilities authorized include about 34 miles of 10-in. natural gas pipe lines extending from a point of connection with Northern's existing line near Ames, Iowa, to the Marshalltown area, a measuring and regulating station at the Marshalltown border, pipe-line extensions to Colo and State Center, and measuring and regulating stations at each town.

Dehydrating Plant Planned For La Reforma Field

CORPUS CHRISTI, Tex.—A gas-gathering and dehydrating system is planned by The Chicago Corp. in La Reforma field, Starr and Hidalgo counties, Southwest Texas.

The company has asked the Texas Railroad Commission for permission to operate with a central separating and dehydration station without the use of lease separators and tanks. A hearing has been set for March 12.

Ontario Company Seeks Permit to Export Gas

Union Gas Co. of Ontario is seeking delivery of natural gas from Texas to Western Ontario, and will ask the United States Federal Power Commission for authority to transport the gas from the United States, according to Thomas Weir, president of the company.

Weir said his company had contracted with the Panhandle Eastern Pipe Line Co. for 500,000,000 cu. ft. of gas. A pipe line between Ontario and the Panhandle system was completed last summer, he said, but only 35,000,000 cu. ft. has been delivered so far. Had the contract been fulfilled, Weir said, the current shortage of gas would have been averted.

1947 Natural Gas Sales Increase 11.4 Per Cent

Sales of natural gas for December 1947 amounted to 2,608,912,000 therms, a gain of 13.1 per cent over the same period a year earlier. On a 12-month basis sales of natural gas in 1947 totaled 25,358,893,000 therms, an increase of 11.4 per cent over the previous year.

In the same 12-month period utility gas sales amounted to 29,179,379,000 therms, an increase of 11.1 per cent over 1946. Manufactured gas sales reflected a gain of 8.1 per cent, while mixed gas sales were up 11.9 per cent.

Natural Gasoline

Humble to Boost Output Of Three Gasoline Plants

HOUSTON.—Installation of additional equipment which is expected to increase production of propane and butane by 67,000 and 7,000 gal. per day respectively is scheduled for three Humble Oil & Refining Co. natural-gasoline plants in East Texas.

Construction is now under way at Humble's London and American plants near Overton and will begin soon at the Kilgore plant. Improvements will be completed on a staggered basis in mid-1948 at a total cost of approximately $2,000,000. Contractor is Fish Engineering Corp.

Propane refrigeration units will be added at each plant, and an oil absorption plant will replace a vapor rectification unit at the American plant.

The London plant will be provided with fractionation facilities to divide the raw product from all three plants into propane, isobutane, and normal butane. Separate central storage and loading facilities are now being completed near the London plant.

Texaco Awards Contract For Compressor Plant

The Texas Co. has awarded a contract to Brown & Root, Inc., to install a compressor plant in Withers field, 10 miles northeast of El Campo, Wharton County, Texas.

Three compressors of 600 hp. each will be installed to compress 9,500,000 cu. ft. of gas daily, which will be used for lift purposes. The excess gas will be sold to gas pipe-line companies.

Silsbee Gasoline Plant Due For August Completion

HOUSTON.—Work is continuing on American Republics Corp.'s Silsbee natural gasoline plant in Hardin County, Texas, with completion due probably in August.

The plant will take about 35,000.000 cu. ft. daily from Silsbee field, and it is planned to reinject and sell the residue gas. Work has been under way about 3 months with Gasoline Plant Construction Corp. the contractor. This will be American Republics' first gasoline plant; it now operates a repressuring plant at Joe's Lake, Tyler County.

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Among the Drilling Contractors

Cold Weather Sends Active Rigs Figure Tumbling

Cold weather across the nation, assisted perhaps by the oft-discussed steel shortage, sent the active rotary-drilling rig figure for January tumbling from the December figure of 2,053 to 1,983—the lowest figures since last August.

Oklahoma, Kansas, and the West Texas-New Mexico area showed the greatest declines. Gulf Coast and Pacific Coast areas held their own, and Illinois registered a gain of five rigs over the previous month.

Active rigs by areas for December and January were as follows, according to Interstate Oil Compact Commission figures:

	Dec.	Jan.
Pacific Coast	163	164
Oklahoma	281	260
Kansas	121	105
Rocky Mountains (including western Canada)	167	161
N. La., E. Tex., and Ark.	154	149
W. Tex. and N. Mex.	551	524
Gulf Coast	531	530
Illinois	85	90
Total	2,053	1,983

Derby Opens Arbuckle Pool

Derby Drilling Co., Wichita, has opened a new Arbuckle pool in Barton County, Kansas, with its 1 Finger, SE NW SW 28-16n-12w, ¼ mile south of new Laudick pool and 1 mile west of Beaver South pool. Derby said 5½-in. pipe was set at 3,364 ft. and plug drilled to 3,370 ft. with well swabbing 2½ bbl. of oil per hour for 4 hours from 200 ft. off bottom.

Black Starts Deep Test

W. H. Black Drilling Co., Midland, is moving in rotary equipment for 12,000-ft. Ellenburger wildcat 8 miles northwest of the Fullerton area, northwest Andrews County, West Texas, for The Texas Co., Humble Oil & Refining Co., and Ralph Lowe, Midland. The Texas Co. will be operator, and test is 1 S. E. Jenkins, SW SW Section 4, Block A-25, Public School Lands Survey.

Gutowsky Brothers Drilling Co., Oklahoma City, is starting a test on 440 acres they have obtained offsetting production in Padgett field, Young County, North Texas. Well is 1 Bishop, Section 347, TE&L Survey. Padgett production is from Mississippi lime at around 4,675 ft., and field was opened a year ago and now has three producers.

Tuley & Carter Drilling Co. have moved their offices to 312 Court Building, Evansville 19, Ind. H. M. Townsend, consulting geologist, will be located in the same office.

R & J Drilling Co. is making hole on a wildcat for Joe Reznik, his 1 Sargeant Community, SW NE NW 1-2s-2e, Jefferson County, Illinois.

George & Wrather, Mount Carmel, Ill., have been issued permit to drill their 1 Fannie G. Putnam, NW 25-1s-12w, Gibson County, Indiana. Scheduled depth is 2,100 ft.

Woods Drilling Co., New Orleans, has completed negotiations with Jerry Crossman, president of Ryan Consolidated Petroleum Corp., Dallas, for acquisition of 80-acre drill site and 50 per cent interest in one of largest blocks left in southern Oklahoma. Block is located in 7s-4w, Jefferson County, Oklahoma, and extends into Montague County, Texas. Test well to Arbuckle lime, estimated at 5,000 ft., will be drilled at early date.

Slaubaugh Brothers have contract for Wabash Petroleum Corp. 2 W. S. Ross, NE SW 22-1n-9w, Pike County, Indiana. Test is scheduled for 1,500 ft.

Northern Development Co., Lloydminster, Sask., has received contract from Continental Oil Co. of Canada, Ltd., for 25-well program in Lloydminster area of Alberta and Saskatchewan. Plans call for continuous drilling, with first well an offset to Dinalta 1 producer, completed recently near Dina, 30 miles south of Lloydminster.

T. M. Pruitt is contractor for W. R. White 1 John F. Goza, wildcat in NE SW SE 20-15s-1e, Pulaski County, Illinois.

Union Rotary Corp., Mount Pleasant, has contract for a 6,000-ft. Sun Oil Co. wildcat to be drilled in Kimball Lake field, Newaygo County, Michigan. Test is scheduled to pene-

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HOUSTON

trate Niargaran and test for possible gas in that zone. Location is in NE SW NE 11-12n-13w, on the approximate high of the field.

Crow Drilling Co., Shreveport, and Delta Production Co. have extended Laton pool, Rooks County, Kansas, ½ mile west with their 1 Gager, SW SW SE 28-8-16. Well pumped 4 bbl. of oil per hour in 10-hour test through perforations from 3,229-33 ft. and 3,201-05 ft. in Lansing-Kansas City lime.

RUNNING High

Two States Drilling Co. Dallas

GROWTH.—Originally organized as a three-way partnership by J. C. Crain, W. R. Hines, and Howard P. Holmes, Two States continued as such until 1947, when W. R. Hines retired. Since then it has operated under the direction of Crain and Holmes. Two States has specialized in deep Permian basin drilling, but has drilled in North and East Texas, and for the past 10 years has had from two to three rigs running in Matagorda County, Texas Gulf Coast. During the war it also operated in Michigan and West Virginia. Considerable production has been acquired, including about 30 wells in the Eunice area of Southeast New Mexico, which are operated by Two States Oil Co., a corporation formed by Crain and Holmes.

RIGS.—Fifteen rotary rigs, ranging from light, mast jobs to extreme-depth equipment with the latter designed primarily for Permian basin drilling.

PERSONNEL.—W. K. Powell, manager, Dallas office; Hugh H. Fouche and Buster Florence, field superintendents, Hobbs; R. S. Gaston, field business manager, Eunice.

SIDELIGHTS.—Two States has been one of the strongest supporters of cost-plus drilling having drilled 175 wells on this basis, maintaining that this method promotes fair pricing and lower costs for both contract parties. Drilling has included Texas discovery wells in Fullerton, Clear Fork, and Ellenburger areas of Andrews County, (where Two States has drilled over 100 wells); Harper field, Ector County; Fargo field, Wilbarger County; and Coke field, Wood County. The firm also supervised operations at the discovery well of Wasson Denver pool. Holmes is past president of American Association of Oilwell Drilling Contractors. The company operates a twin-engined Beechcraft plane.

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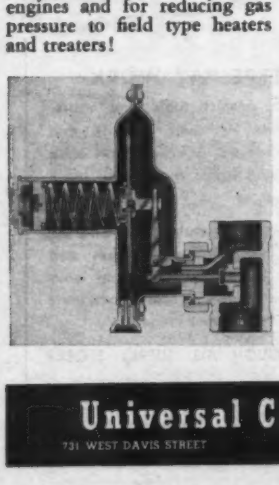

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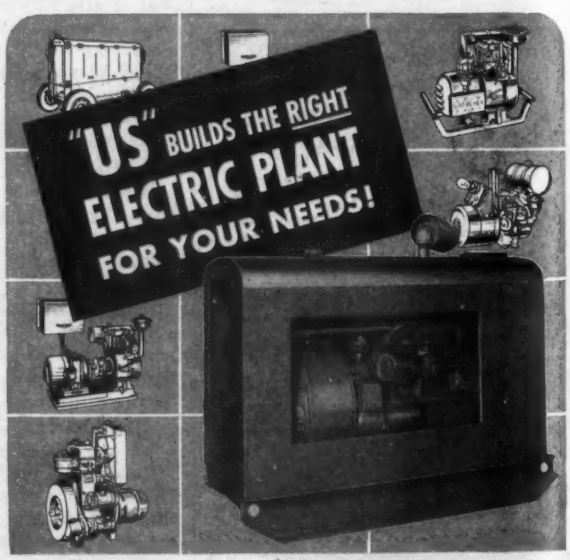

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PIPE LINES

East Tennessee Plans For 1949 Construction

East Tennessee Natural Gas Co. has been authorized by Federal Power Commission to build a natural-gas system estimated to cost $11,470,592 to serve Chattanooga, Knoxville, and other communities. Construction work is to be handled by N. A. Saigh Co.

Facilities include approximately 186 miles of 16-in. transmission line from a point on the main line of Tennessee Gas Transmission Co. near that company's compressor station No. 10 to near Chickamauga Dam in the vicinity of Chattanooga; a 12¾-in. line about 112 miles long from the Chickamauga Dam area to a point near Knoxville, and a number of lateral lines.

In addition to service to Chattanooga and Knoxville, East Tennessee proposes to serve towns between Lobelville and Chattanooga, including Mount Pleasant, Columbia, Lewisburg, Shelbyville, Fayetteville, Lynchburg, Tracy City, South Pittsburgh, Richard City, Jasper and Whitwell. Towns between Chattanooga and Knoxville proposed to be served are: Coltewah, Cleveland, Charleston, Calhoun, Riceville, Athens, Sweetwater, Loudon, Lenoir City, Alcoa, Maryville, and Rockville. Service is contemplated also to Centerville, Waynesboro, Lawrenceburg, Pulaski, Murfreesboro, Manchester, Dechard, Benton, Englewood, Etowah, and Philadelphia.

East Tennessee will purchase its gas from Tennessee Gas Transmission Co. Under this contract, Tennessee Gas Transmission Co. agrees to supply East Tennessee in the area for a period of 20 years. After the 20-year period the contract would continue on a year-to-year basis unless terminated by either of the companies involved.

Average Cost of Repair Of Pipe-Line Leaks $1,000

Cost of repairing pipe-line leaks under current operating conditions has been found to be approximately $1,000 per leak on crude-oil and products lines, according to D. B. Good, corrosion engineer, The Texas Pipe Line Co.

Results of a study of leak-repair costs were contained in a paper entitled "Economic Factors Bearing on Application of Cathodic Protection," delivered before the Tulsa chapter of the National Association of Corrosion Engineers, February 13. These repair costs included only the expense entailed in the repair operations and did not include loss of oil or products, damage done, or costs due to interruption in service. While at first the cost seemed high, it was generally conceded in the discussion following the paper, that the figure was consistent with the experience of several extensive pipe systems.

Much expensive reconditioning is being avoided as the result of cathodic protection, Good said. Furthermore, cathodic protection is becoming vital for modern pipe-line facilities designed with higher tensile strength and thinner wall pipe. Attention was given in the group discussion to the various factors involved in determining an optimum economic balance between expenditures for coating, on one hand, and cathodic protection on the other.

Interstate Completing Antioch Extension

Early this week Interstate Oil Pipe Line Co. was in the process of completing a 7½-mile Maysville-Antioch extension to its Oklahoma City-Maysville system. Midwestern Constructors, Inc., laid pipe for both this system and the extension.

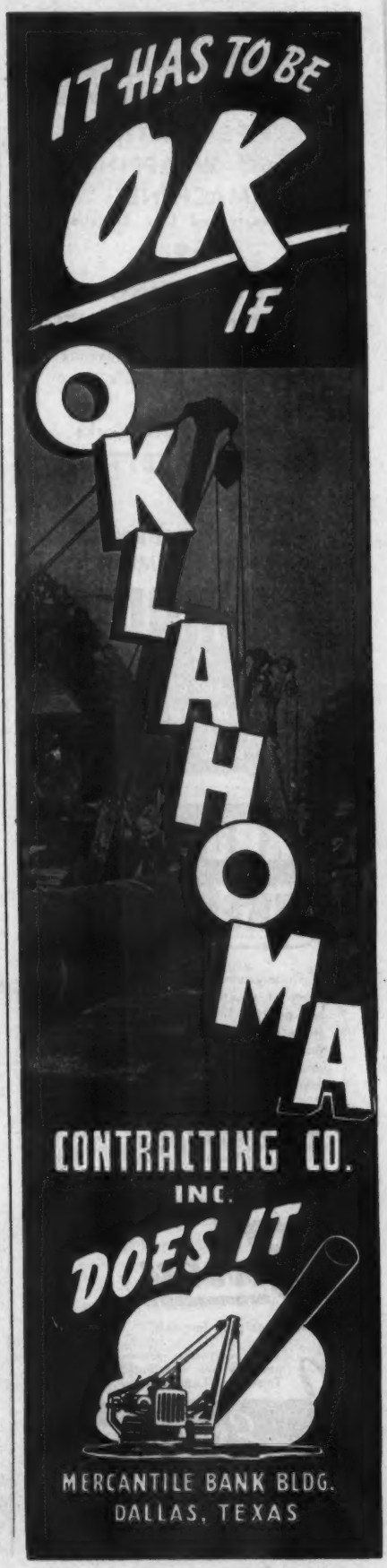
Portable pumping equipment is being installed at Maysville where the building of a pump station has been contracted by Joe P. Asher Construction Co.

Socony-Vacuum to Begin Products Line in May

Socony-Vacuum Oil Co., Inc., will start construction in May on the 125-mile 6-in. products line to be built from South Portland via Auburn and Hallowell to Bangor, Me. Completion is scheduled for July.

Northwest Natural Asks FPC Approval for Line

Northwest Natural Gas Co. has applied to the Federal Power Commission for authorization to construct its proposed natural-gas line from the Canadian border near Kingsgate,



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British Columbia, through Idaho, Washington and Oregon and on to the Canadian border near Vancouver, B. C. Cost of the line and facilities has been estimated at $41,931,000. No estimate was included as to cost or extent of necessary lateral lines.

The company stated that gas supplies were to be obtained from fields in Alberta and that facilities necessary to gather and transport the gas to the border were estimated to cost $36,568,000. These facilities would be constructed either directly by Northwest Natural or indirectly through a subsidiary or affiliate.

This project would provide for supplying the gas requirements of distributing companies in Vancouver and Trail, in British Columbia, and in Seattle, Spokane, Tacoma, and Walla Walla, Wash., and in Portland, Ore.

The project would entail the laying of 606 miles of 24-in. pipe from the Canadian border near Kingsgate to Seattle and 150 miles of 18-in. pipe from Seattle to the Canadian border. Various lateral lines and four compressor stations with an aggregate installation of 28,650 hp. would also be included in the project. Maximum daily capacity would be 209,000,000 cu. ft.

Construction would be commenced in the early part of 1950 or earlier if materials are available, and would be completed within the year unless the scarcity of pipe delays the project.

Northwest Natural stated that it is negotiating with producers in Alberta for contracts for natural gas under which the producers would maintain gas reserves at 150 per cent of the company's requirements for a period of 25 years.

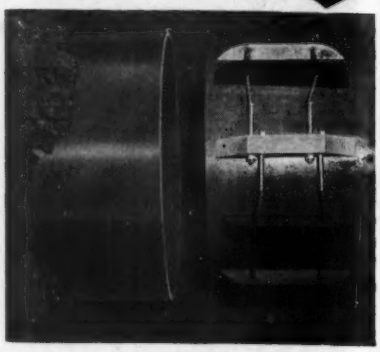
Negotiations are being carried on by the Northwest organization with gas distributing companies in the area to be served. Northwest Natural was organized in February 1946.

Posa Rica-Mexico City Gas Line Laid by Pemex

Petroleos Mexicanos is laying a 150-mile 20-in. natural gas pipe line from the Posa Rica field to Mexico City. Because of the high reservoir pressure in the field, there will be no compressors installed for initial operation of the project.

The main pipe laying operations have been contracted by Williams Brothers Co. These are being carried on under the direction of Guy S. Connors, vice president. H. L. (Red) Davis is the superintendent, John Williams, resident engineer; Hill Reynolds, assistant superintendent; George Bayles, office manager; and John Brand, traffic expediter. The contractor's headquarters are at Santa Clara near Mexico City.

WRITE FOR LATEST INFORMATION
The New Williamson PIPE LINE CASING INSULATOR*



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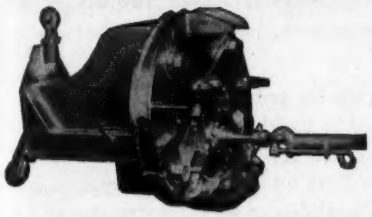

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The line will be protected by coating and wrapping. Williams Brothers' contract will be over $2,500,000.

Construction got under way in January and is scheduled for completion this year. The line will supply industrial users in Mexico City with approximately 50,000,000 cu. ft. daily.

Anchor Is Completing Church Point-Eola Line

Anchor Gasoline Corp. is completing a 35-mile, 6-in. gas line from Church Point to Eola, La., for transmitting 10,000,000 cu. ft. daily to the company's Eola gasoline plant. The line is being laid by contract with Townsend Brothers.

Canol Salvage Operations Proceed Through Winter

Before the spring ice breakup it is anticipated that more than 400 miles of 596-mile Canol project in northern Canada will have been salvaged. The movement of pipe is being facilitated by the frozen terrain. Approximately 200 miles of this pipe has been taken up since October.

The pipe line, built at a $133,000,000 cost, was sold last fall to salvage firms at New York, Pittsburgh and Brooklyn for $700,000.

The pipe has been going to Texas oil fields and some may be shipped to South America.

The salvage work started at the Whitehorse, Y. T., end of the line. The pipe is trucked to a railhead at Carcross, Y. T., and loaded on ships at Skagway, Alaska.

Three Directors Named to National Transit Board

W. S. Zehrung, president of Pennzoil Co., Oil City, Pa.; John Seldan, general council of South Penn Oil Co., Bradford, Pa.; and Harry Logan, president of United Refining Co., Warren, Pa.; have been elected directors of National Transit Co.

Control of this pipe line was returned to the Pennsylvania Grade crude-oil group early this month *(see The Oil and Gas Journal, January 8, for details of the transaction)* when a group of refiners and producers purchased the stock held by two New York concerns.

The new directors succeed three of the four representatives of the New York group, who secured control of the company through the purchase of stock from the Rockefeller Foundation early in 1947. Those resigning last week were: Jerome A. Newman, vice president of Graham Newman Corp.; Milton Steinbach, and Allen C. Dubois, partners in Wertheim & Co.

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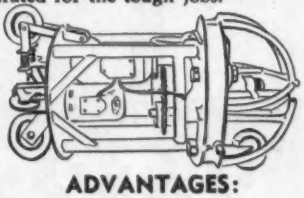

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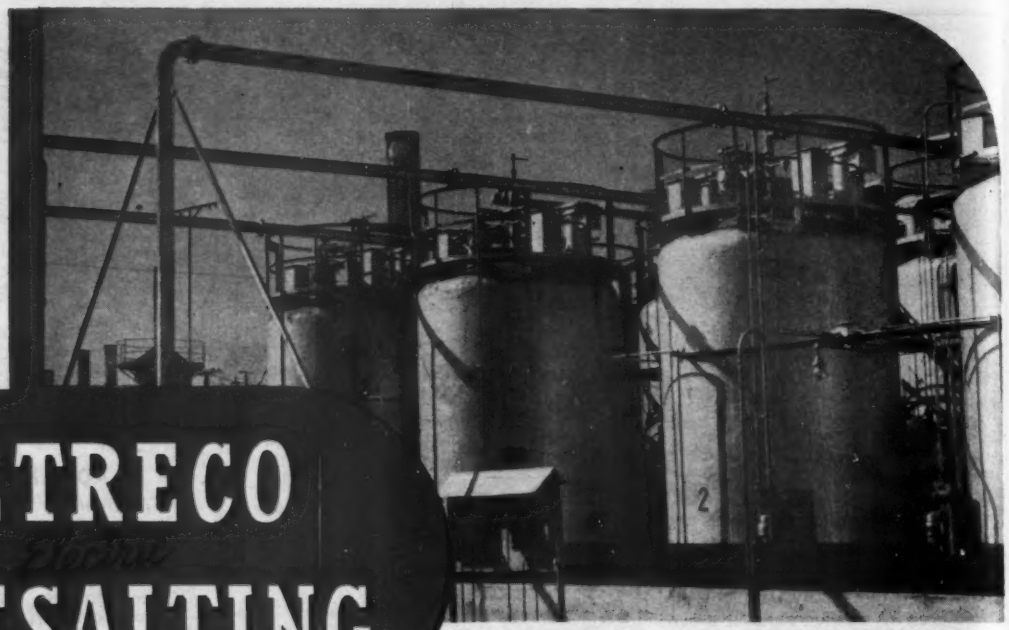

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In the face of increasing demands for petroleum products, and the scarcity of steel required to build the refining units needed to provide greater capacities, it is absolutely necessary to get maximum efficiency from available equipment. This is exactly what Petreco Desalting is enabling many refiners to do; if you are charging salty crudes, we can help you, too.

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PR 48-1

REFINING

Humble Sets Records, Plans Big Expansion

HOUSTON.—In a summary of what Humble Oil & Refining Co. is doing to meet current record demands for petroleum products, H. C. Wiess, company president, last week said Humble's Baytown, Tex., refinery is now exceeding its design capacity by about 25 per cent and that plans are under way to spend $19,000,000 for new plant facilities.

The Baytown refinery is currently running 238,000 bbl. of crude oil daily. About 95,000 bbl. of heating oils are being manufactured daily, a total which exceeds the refinery's gasoline production.

This unusual production of oil for heating, Wiess said, has been obtained only by reducing manufacture of higher-priced gasoline and by careful use of all available facilities at higher costs of manufacturing than economically warranted.

The throughput at the Baytown refinery at the present time is about 38,000 bbl. daily above the record achieved at the peak of operations during the war. Despite the emphasis on volume, Wiess said, quality is not being sacrificed.

The $19,000,000 expansion program to be started in 1948 represents a larger expenditure than that made in any one of the war years when plants for high-octane aviation gasoline were built. Major item in the expansion will be a new pipe still which will step up the refinery's capacity about 45,000 bbl. daily, or about 20 per cent. A new plant for the manufacture of a greater quantity of high-quality lubricants is to be completed soon, and construction is to get under way in the near future on modernization of the mechanical shops.

Discussing the production records at Baytown, Wiess said a great share of the credit is due the 6,000 workers at the refinery. "Their combined efforts to put the last possible barrel of oil through each unit, to keep operations flowing smoothly, and to minimize the time spent on repairs are the basis of the refinery's achievements," he said.

Wiess said the information on plans and accomplishments at the refinery normally would be made public in the company's annual statement but that it is being issued now because of the widespread interest in the oil situation. It illustrates, he continued, the extraordinary efforts the whole industry is making. Another report on what Humble is doing in the field of exploration, drilling, and production, which is the basis of product supply, will follow in a short time, he said.

General Increase Shown In Gasoline Octane Rating

A steady increase in the octane ratings of motor gasolines is indicated in the Bureau of Mines semi-annual motor-fuels survey.

The average octane rating of premium gasoline samples collected from 17 marketing areas last summer was 79.2, compared with 78.3 during the summer of 1946 and 74.9 in 1945.

The average octane rating of regular gasoline was 75.1 in 1947, 74.4 in 1946, and 69.7 in 1945.

While octane ratings showed increases, little change from 1946 was noted in volatility and distillation characteristics of the samples, the Bureau said.

Free copies of the detailed report, showing octane-rating comparisons by years for the various marketing areas may be obtained from the bureau's publications distribution section.

Frontier Contracts For Additional Oil

Frontier Refining Co. of Denver has announced contracts with California Co. for approximately 1,000 bbl. daily of Tensleep production from Quealy dome and the Muddy sand production from Seven Mile.

Frontier also holds a 5-year contract with Standard Oil Co. (Ind.) for 7,000 bbl. of oil daily from Big Horn Basin fields. The crude oil in both these contracts is refined in the Frontier plant at Cheyenne, Wyo.

Fuel Oil Gas Consumption By Utilities Sets Record

A record total of 45,300,002 bbl. of oil was consumed by electric utility power plants during 1947, an increase of 24.7 per cent over the previous year, according to the Federal Power Commission. Fuel oil con-

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The Foxboro Dynalog, the L & N Micromax, the Brown straight electric or ElectroniK remote receiving instruments can all be readily connected to F & P FLOWRATOR instruments with impedance bridge transmitters for measuring fluid flow. Thus F & P instruments can be fitted into jobs with unified instrument panels equipped with any one of these three brands of instruments. No breaking up of your panel layout is necessary. F & P is not wedded to just one make of remote instrument, is not restricted in working out instrumentation problems to your best interests.

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sumed during December totaled 4,261,150 bbl., an increase of 10.3 per cent compared with November 1947 but 19.8 per cent below December 1946.

Gas consumption amounted to 373,168,761,000 cu. ft. in 1947, an increase of 21.6 per cent over the previous year and 4 per cent more than the record year of 1944. During December 30,021,182,000 cu. ft. of gas was used, an increase of 37.4 per cent over December 1946, but 2.5 per cent below the consumption of November 1947.

Fuel-oil stocks on hand January 1, 1948, were sufficient to last 49 days against 52 days a month before and 35 days a year ago. Stocks totaled 6,691,655 bbl.

Gulf Reported Planning Staten Island Refinery

NEW YORK. — As a long-range plan, Gulf Oil Corp. reportedly is planning to build a large, modern refinery on Staten Island, site of the company's 15,000-bbl. a day topping plant.

Preliminary plans reportedly call for installation of cracking facilities and a design to handle either sweet or sour crude. With Gulf stepping up production of its Middle East crude oil in Kuwait, a possibility is seen that some of this crude might be used in the new plant.

Lack of steel and other materials indicates that completion date will be far in the future.

Cities Service to Build Grease Plant in Chicago

A compound and grease plant with an annual capacity of 16,000,000 gal. of lubricating oils and 5,000,000 to 7,000,000 lb. of grease is being planned by Cities Service Oil Co. in Chicago.

The company reportedly has purchased a 42-acre tract on the sanitary canal on the east side of Cicero Avenue.

The plant will obtain blending stocks from a solvent refined lubricating oil plant now being built at Lake Charles, La., by Citcon Oil Corp., jointly owned by Cities Service and Continental Oil Co.

The new plant is to be completed in 1949.

Gulf Introduces New Torque Converter Fluid

To meet expanding use of torque converter drives in bus operation, Gulf Oil Corp. has developed a new torque converter fluid, characterized by high resistance to oxidation for prevention of deposits.

The new product has a high viscosity index and a pour point of —25° F.

Husky to Boost Output Of Lloydminster Refinery

LLOYDMINSTER, Alta. — Husky Refining Co. is planning to increase the capacity of its refinery here from its present throughput of 2,500 bbl. daily to 7,500 bbl. daily.

Lloydminster heavy crudes, ranging from 10° to 20° A.P.I. gravity, go chiefly into asphalt production, with considerable proportions of fuel, diesel, and furnace oil and about 7 per cent gasoline.

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Exploration and Drilling

Interrelationship of New Exploration Tools With Old

THE eagerly awaited paper about the self-potential curve on the electric log has been presented at the A.I.M.E. meeting in New York. Briefly, the new paper presents the results of a substantial amount of research and thought on the meaning of this curve. Some comparatively simple rules are presented, by which, under favorable conditions, the S. P. can be analyzed and interpreted to detect the presence of oil in a formation, and estimate shale-sand footage.

It is found that the S. P. log is not an absolute measurement of permeability or porosity, but is also affected by several other physical factors, among them particularly the resistivity of the mud and the formations, and also the formation thicknesses.

This will not come as any great surprise to geophysicists, petroleum engineers, geologists, or mud engineers. It is a logical development to be expected in the light of discoveries in several different fields which has become generally known.

Specialization in mud control brought in the mud engineer. This in turn brought research and liaison between laboratory and field application. It soon became apparent that the properties of a good drilling mud were sometimes harmful, or at least there was reason to suspect they were harmful, to the producibility of the oil formation. Some of the answers were found in starch muds, or in oil-base muds, for special cases.

Then came the research in clay minerals, or perhaps it is better to say it was going on concurrently with mud research. The effect of the pH value of fluids on clay minerals, and the reasons therefor, have influenced mud engineers, reservoir engineers, geologists, and secondary-recovery engineers.

The work on core analysis confirms some of the findings in these other fields, and also poses some new problems, as well as giving some new light on the interrelationship of all the known factors.

Now this new tool for interpreting the S. P. log should aid in correlating the work in several fields in terms of practical results in specific well completions. It almost points directly to a new field of specialization, that of "completion engineers"; men who will correlate the knowledge of the geologist, the geophysicist, the mud engineer, the reservoir engineer, and work directly with the driller.

Recent Journal References on Electric Logging

"Electric Logging: A Study of the Self-Potential Curve" (10-4-47, p. 72), "The Resistivity Curves" (10-25-47, p. 94), "Factors Which Affect True Formation Resistivity" (11-1-47, p. 76), "Factors Affecting Measured Apparent Formation Resistivities" (11-22-47, p. 63), "Electric-Log Interpretations" (12-6-47, p. 84)—by Sylvain J. Pirson.

"True Resistivity Determination from the Electric Log—Its Application to Log Analysis"—by H. G. Doll, J. C. Legrand, and E. F. Stratton, 9-20-47, p. 297.

"New Electrical Logging Techniques in California"—by J. C. Stick, Jr., J. S. Baker, and R. G. Norelius, 5-17-47, p. 82.

"Electrical Well Logging: A Study of the Self-Potential Curve"—by Charles C. White, 12-14-46, p. 88.

"Electrical Logging Widely Employed in Rocky Mountain Exploratory Tests"—by Charles J. Deegan, 4-7-45, p. 60.

"Radioactivity Well Logging"—V. J. Mercier, 5-5-45, p. 90.

"Resistivity of Pay and Nonpay" (12-16-44, p. 88), "Characteristics of Electric Logs" (12-23-44, p. 75), "Application of Electric Log Data" (12-30-44, p. 270)—by Park J. Jones.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

TEXAS GULF COAST.—Latest reports are that the burning Seaboard Oil 1 Power & Woodworth, Refugio County wildcat, 4½ miles north of Vidauri, which became one of the worst oil well fires in the area for the past 10 or more years, has been brought under control. The well was drilling at 6,850 ft. when it blew out. When operators attempted drill pipe recovery, protective casing, blowout preventer and drill pipe were sucked into the hole and the well, making oil and gas, caught fire with flames shooting as high as 200 ft.

ROCKY MOUNTAIN.—A test of 1,069 bbl. of oil per day from the Tensleep in Ohio Oil Co.'s second Hatfield well increased the importance of that field during the past week. Phillips and Kerr-McGee are preparing to deepen the Sheldon Dome east extension to the heretofore untested Madison after the Tensleep showed only an estimated 100 bbl. per day natural. At Elk Basin, Carter Oil Co. 8 Johnson-Watson failed in the Madison and will be completed as a Tensleep extension. The Texas Co. is abandoning its North Douglas Creek wildcat.

WEST TEXAS.—Latest reports on Anderson-Prichard and Vickers 1 Foster, Sterling County prospective discovery, indicated an average flow of 41 bbl. of oil per hour, on first 5 hours of a 72-hour test. Production is from the Lower Permian but operators will continue drilling to the contract depth of 8,500 ft., or to the Ellenburger. Humble prepares to test the Ellenburger 3 miles from Slick-Urschel Oil Co.'s recent Upton County discovery.

CALIFORNIA.—Jergins Oil and North American Oil Consolidated 1 McCool, San Ardo area of Monterey County, cored oil sand at 1,940 ft., running high on The Texas Co.'s discovery well completed last November for 84 bbl. per day. Standard Oil of California abandons its 1 Maxwell at 17,696 ft., a new depth record for the state but 127 ft. short of the world's record for drilling.

OKLAHOMA.—A new deep pool in Caddo County is indicated by Magnolia Petroleum Co. 1-A Miller, 14-6n-9w, which flowed 15 bbl. of oil in 30 minutes from perforations at 10,650-55 ft. The well is still testing.

EAST TEXAS.—Arrow Drilling et al 1 Allen, Harrison County test, has promising indications of extending the Longwood field of Caddo Parish, Louisiana, after flowing 150 bbl. of oil per day by heads.

Baash-Ross News

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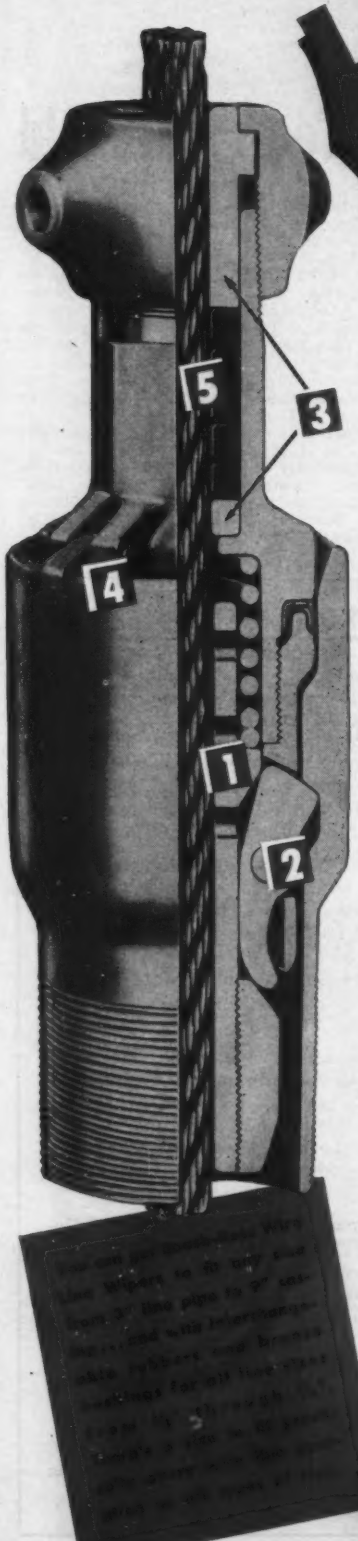

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CALIFORNIA

San Ardo Area Well Shows Oil in Core Test

LOS ANGELES.—Interest in the San Ardo area of Monterey County took an upturn this week when oil sand was cored in a test well located in 27-22s-10e, almost a mile north of The Texas Co. 1 Lombardi discovery well. Jergins Oil Co. and North American Oil Consolidated joint test, 1 McCool, cored the top of the sand at about 1,940 ft. or 170 ft. higher on structure than The Texas Co.'s Lombardi discovery. The operators have cored ahead to about 2,000 ft. and are expected to make a test in a few days. Meanwhile, location has been staked for 3-1 McCool.

The Texas Co. discovery produced on completion last November 84 bbl. a day of 10°-gravity oil from the Pancho Rico formation of Pliocene-Upper Miocene age.

Impressive production figures for Seaboard Oil Co.'s deep test in the old Lawndale field of Los Angeles County, 81-20 Pauley-Seaboard in 20-3s-14w, were revealed this week. The well is flowing 240 bbl. a day of 60.4° gravity clean distillate and 4,525,000 cu. ft. of gas through a ⅛-in. choke from the Schist conglomerate. Seaboard discovered oil in the Schist last summer in its 1 Johnson about ¾-mile northwest. The Johnson well, however, experienced considerable water trouble.

Standard Oil Co. of California has formally announced the abandonment of its Montalvo area deep test, 1 Maxwell in 23-2n-23s, Ventura County. The well was 127 ft. short of the world's depth record when the drill pipe stuck and repeated efforts failed to loosen the entire string. Almost 13,000 ft. of the drill pipe was recovered last week. No oil was found, the company stated. The well established a new California depth record, supplanting the record of 16,668 ft. made by Pacific Western Oil Corp. in its 1 National Royalties in Kern County about a year ago. Standard has staked a location for a new Montalvo area test, 1 Eastwood on 32-2n-22w, about 3 miles east of its 2 McGrath discovery well, brought in last April in 25-2n-23w. The new location is also about 4,500 ft. east of a duster drilled on the Leonard Ranch by Shell Oil Co., Inc., to 3,600 ft. in 1930.

Shell Oil Co., Inc., has brought in its 1 Moser Community in the northwest Athens area of Los Angeles County, 12-3s-14w, for a reported 700 to 800 bbl. a day of 31° gravity clean oil. Total depth is 9,013 ft. plugged to 8,850 ft. The completion constitutes an extension of an existing pool discovered ¼ mile to the northwest by Shell several months ago. Later development work may show that both wells are an extension of production in the Athens-Rosecrans field to the southeast.

It is reported that a wildcat being drilled in Nevada by Nevada Exploration Co. near the town of Sloan in 13-23s-60e, has had encouraging indications in the Pennsylvanian formation. Charles Aston, consulting geologist of Artesia, N. M., states that definite indications of crude petroleum were found between 1,357 and 1,685 ft. The well, known as 1 Porter, is bottomed in Mississippian at 2,019 ft. Base of the Pennsylvanian was logged at 1,730 ft. It is understood that tests were to be made of showings this week.

CALIFORNIA WILDCAT FAILURES

Kern County, Devils Den area: Barnsdall Oil Co. 1 Robertson, 20-25s-19e, elev. 475 ft., dry, TD 4,430 ft.

Edison area: Mar-Roo Syndicate 1 Garlinger Community, 6-30s-29e, dry, elev. unknown, TD 4,622 ft.

Kern Bluff area: Oceanic Oil Co. and Universal Cons. Oil Co. 21 Needham-Bloemer, 7-29s-29e, dry, elev. 787 ft., top sand 840 ft., TD 990 ft.

San Luis Obispo County, Cuyama Valley area: Cuyama Oil Co. 1, 25-11n-28w, dry, elev. 1,777 ft., top Gray sand 1,960 ft., TD 2,036 ft.

Cuyama area: E. Jorgensen 1 Indian, 23-11n-28w, dry, elev. unknown, TD 2,620 ft.

Colusa County, Meridian area: Honolulu Oil Corp., 1 Honolulu-Barnsdall Unit 1, 23-15n-1w, dry, TD 4,286 ft.

EASTERN TEXAS

Producer May Indicate Longwood Field Extension

DALLAS.—After several disappointments in what started out to be an extension area to Longwood field of Caddo Parish, Louisiana, Arrow Drilling Co. and Sells Petroleum Co. this week apparently had good flowing production at their 1 Allen, D. M. Evans Survey, 4 miles southeast of the town of Leigh. Perforations were in the Leake sand, (productive in Caddo Parish), between 6,093-6,105 ft. Reports credited the well with flowing by heads after being swabbed in. Estimated daily recovery was 150 bbl. of 40°-gravity oil a day. The flow was through ¼-in. choke, on a gas-oil ratio of 800 cu. ft. Casing was sealed and flowing tubing pressure was 150 psi. Operators were erecting tanks for completion tests, and were understood to have applied for discovery allowable. The 12-ft. pay section indicated (lower Travis Peak), is regarded of major importance, since it is considerably thicker than that in Caddo Parish. Nearest production in that direction is about 2 miles to the east. Gulf Oil Corp., Stanolind Oil & Gas Co., Humble Oil & Refining Co., and Phillips Petroleum Co. are said to hold offset acreage to the 188-acre tract of the discovery.

In Jefferson Rodessa field, Marion County, Paul Pewitt 1-B Ralph had indications of pay in the Travis Peak. On a 140-minute drill-stem test between 7,980-8,012 ft., the recovery was 300 ft. of oil. No water was reported with the oil. Operators were drilling ahead below 8,185 ft. Regular producing zones for the field are the Rodessa and Pettit sections.

General Crude Oil Co. has made location for a second offset test to its lone Woodbine producer west of William Wise field in Cherokee County. The test will be 2 J. W. Summers, 1,365 ft. from west and 550 ft. from south lines of the lease in the John Hunt Survey. Location is 1,200 ft. southeast of the discovery. General's first offset, a dry hole, was northeast of the discovery.

Prospects of a second producer in Blackfoot field of Anderson County continued at The Texas Co. 1 Broadway. From perforations in the Rodessa at 8,972-92 ft., after acid treatment, the well flowed by heads, making approximately 27 bbl. of oil plus 20 bbl. of acid water. The Blackfoot discovery was in the Pettit limestone.

East Texas completions have shown a seasonal decline. Four oil wells, 1 gas and 3 dry holes were reported for the week. Ten new locations were announced for the following counties: Cherokee 1, Henderson 2, Limestone 1, Marion 2, Panola 1, and Wood 3. In Anderson County, Phillips Petroleum Co. abandoned location for its 1 R. F. Broadway, which was to have been a southeast offset to the Blackfoot field discovery well.

EAST TEXAS WILDCAT FAILURES (DISTRICTS 5 AND 6)

Cherokee County: R. W. Fair 1 C. S. Ousley, M. C. Lomax Sur., 2½ mi. NE Gallatin, dry, TD 4,820 ft. in Georgetown, no shows.

General Crude Oil Co. 1 C. F. Edwards, John Martin Sur., 9 mi. SW Rusk, and 1,200 ft. NE 1 Summers discovery, dry, TD 5,265 ft., Austin 4,905-5,144 ft., Woodbine 5,200-65 ft., by samples.

Limestone County: Nu Enamel Corp. 1 Douglas B. Cogwell, P. Varela Sur., 6 mi. W Mexia, dry, TD 2,846 ft., Austin 2,605 ft., Woodbine 2,847 ft., by samples.

LA.-ARK.

Barnsdall Well Has Gas Showing at 6,821 Ft.

SHREVEPORT.—Barnsdall Oil Corp. 1 Davis Bros., 7-16n-4w, Bienville Parish, was drilling ahead below 7,124 ft. after testing gas shows. It cored a fair gas odor at 6,821-41 ft., and again between 7,075-95 ft. in a porous sand. A drill-stem test at 7,034-95 ft., using ¼-in. chokes and 1,000 ft. of water cushion, produced a good blow at the surface but recovered 5,490 ft. of salt water, with no shows. Bottom-hole flowing pressure was 3,020 psi. Tests were in the Travis Peak, topped at 7,035 ft., by samples.

In Madison Parish, Curtis A. Kinard 1 Sondheimer, 36-18n-12e, had total depth at 4,180 ft. and was running side-wall cores. Operators reported a drilling break between 3,815-18 ft., circulating fine-grained sand. Markers reported were the chalk at 3,736 ft., and lower Cretaceous at 3,774 ft.

Carter Oil Co. 1 Gandy, 28-19n-7w, was waiting on cement after setting casing to 11,001 ft., 1 ft. off bottom. Carter's 1 Marvin Matthews, 22-18n-1w, Lincoln Parish, was drilling in sand and shale below 8,301 ft.

Shell Oil Co., Inc., 1 Frost Lumber Co., 15-22n-1e, was drilling below 6,808 ft. No tests had been made in the Cotton Valley, topped at 5,618 ft., on last report. Delta Drilling Co. 1 Tremont, Winn Parish test in 15-10n-1w, was drilling below 4,890 ft. with no shows reported.

In Atlanta field, Columbia County, Tide Water-Seaboard Oil Co. 1-B Eads, SW NW 9-18s-19w, was flowing at an estimated 100 bbl. of oil a day, through ¼-in. choke. Oil tested 45° gravity and was coming from perforations between 8,262-64 ft.

Wildcat drilling reports included Robert O'Meara 1 Moody, 12-16s-22w, Columbia County, reaming after coring, with total depth unchanged at 7,243 ft. In Nevada County, Caddo Oil Co., Inc., 1 Christopher, SE SE 9-11s-22w, was drilling below 2,710 ft. E. G. Bradham 1 C. A. Ward, Union County, had total depth at 4,000 ft. and was preparing to move in heavier rig. R. B. Curtis 1 R. Sheridan, NW SW 31-6n-7w, was fishing reamer at 1,745 ft., total depth.

Arkansas completions for the week were four dry wildcats and one dry hole in Magnolia field, Columbia County. Of the six new locations, Columbia County received four, while Miller and Ouachita counties each had one.

Fifteen completed wells in Louisiana were: Ten oil (including two distillate, one gas and four dry. First reports totaled 19. Union County led with six, all in Ora field; Caddo had four, Lincon three, and one each in Claiborne, Franklin, LaSalle, Richland, Sabine and Webster parishes. Webster's new test is Hunt Oil 1 Ardis Burns, a projected 10,000-ft. wildcat in SW NW 16-23n-9w. It is reported to be on a 15,000-acre block, and on both geological and subsurface prospect.

NORTH LOUISIANA WILDCAT FAILURES

Grant Parish: W. O. Woodward 1 Edenborn, NE NE 14-8n-14w, dry, TD 7,963 ft., no tops reported.

Union Parish: C. R. Schuster 1 F. Lewis, NW NW NE 18-20n-1w, dry, TD 2,250 ft., Nacatoch 2,175 ft., elev. 169 ft.

ARKANSAS WILDCAT FAILURES

Columbia County: G. H. Vaughn 1 McCall, NW NE SE 30-17s-18w, dry, TD 7,711 ft., Travis Peak 3,947 ft., Cotton Valley 5,435 ft., Buckner 7,287 ft., Smackover 7,604 ft., porosity 7,629 ft., elev. 267 ft.

Hempstead County: Carter Oil Co. 1 Nora Carrigan, SW NW 18-13s-23w, dry, TD 3,801 ft., Nacatoch 560 ft., Tokio 1,553 ft., Massive anhydrite 1,956-2,068 ft.,

James 2,438-83 ft., Travis Peak 2,683 ft., Cotton Valley 3,321 ft., elev. 368 ft.

Union County: Mul-Berry Oil Co. 1-A Randolph Smith, SW NW NW 25-18s-15w, dry, TD 2,200 ft.

Howard B. Ward 1 G. A. Patterson, NW NE NW 30-18s-14w, dry, TD 2,467 ft., oil show 2,460 ft., elev. 175 ft.

MICHIGAN

Five Oil Producers Completed in Michigan

SAGINAW.—Five of the week's 10 completions in Michigan last week were oil producers and one was a gas well. The producers included a 5-bbl. wildcat in Overisel Township, Allegan County, and another good producer in Kimball Lake field, Newaygo County, where Sun Oil Co. 4 Vile came in for initial potential of 660 bbl. a day. Other production included Gulf Refining Co. 3 Goulet in Kawkawlin of Bay County for 70 bbl., Major & Riddell 1 Currier in Arbela of Tuscola County for 10 bbl., and Eugene Hilliard H-2 State-Roscommon in Roscommon County for 25 bbl. Three of the dry holes were wildcats.

Subnormal cold continued to interfere with field operations and only nine new locations were announced, two in Allegan County, one each in Arenac, Bay, Berrien, Manistee, Montcalm, Muskegon and Van Buren.

MICHIGAN SUCCESSFUL WILDCAT

Allegan County, Overisel Township: J. W. Lang Co. 1 Albert Sneller, NE NW SW 3-4n-14w, pumping 5 bbl., acidized, TD 1,487 ft. in Traverse limestone.

MICHIGAN WILDCAT FAILURES

Bay County, Garfield Township: Talbot Oil Co. 1 E. Flajole et al, NE SW NW 19-16n-3e, dry in Dundee, TD 3,403 ft.

Ionia County, North Plains Township: H. M. McClure 2 Leo and Thomas Fox, NW NW SW 23-8n-5w, dry in Dundee, TD 2,987 ft.

Saginaw County, Fremont Township: Charles W. Teater 1 Albert Hatzke, NE SW NW 4-11n-2e, dry in Dundee, TD 3,169 ft.

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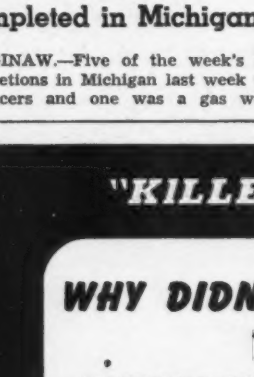

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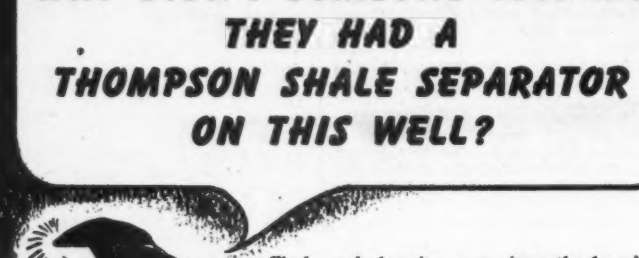

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CANADIAN FIELDS

Gulf Canadian Starts Two Tests in Alberta

CHATHAM. — Two important tests are being started by Gulf Canadian Oil Co. in the northern and central plains area of Alberta. The areas are north and south of Leduc field, and geological conditions are believed similar.

The more northerly test, in the Barrhead area about 50 miles northwest of Edmonton, is Marine Oil Co. 1 Alice M. O'Brien, LSD 4, 12-59-3w5, which recently spudded.

In an area some 30 miles west and south of Red Deer, Western Canadian Oil Co. 1 Louis Warren is moving equipment to location for an early start. Both tests are being handled by newly organized subsidiaries of Gulf Canadian.

In the southwestern Alberta foothills, Gulf Canadian 1 Pincher Creek, LSD 15, 24-3-29w4, bottoming at 11,927 ft. in Madison limestone, has recemented 7-in. casing and is testing a wet gas flow, estimated 10,000,000 cu. ft. a day, encountered in the limestone at 11,800 ft.

Leduc.—In Leduc field, Globe-Leduc 8, LSD 10, 34-50-26w4, bottoming at 4,971 ft., started flowing from the D-2 zone 1½ hours after tester was opened, being the first Leduc well to flow from this horizon on drill-stem test. Definite production test of the horizon is being made. Globe-Leduc 7, LSD 5, 19-50-26w4, has spudded. East Leduc-South Brazeau 3, LSD 7, 9-50-26w4, in the south end of the field, finished at 5,409 ft. It made 1,011 bbl. on 8-hour run.

Northeast of the proven field, East Leduc 2, LSD 10, 5-51-25w4, which contacted the D-2 zone at 4,853 ft., is deepening below 5,100 ft. to test the D-3. Production at this point would mean a marked extension of the field.

Another extension is being sought by Okalta-Leduc 2, spudding in LSD 10, 33-49-26w4, in a new area some miles south and a little west of the proven field. Home-Leduc 3, LSD 14, 21-50-26w4, is making first drill-stem test before deepening to D-3. Continental 1, LSD 2, 9-50-26w4, finished at 5,410 ft. It made 115 bbl. an hour on initial test, shutting down after storage was filled.

Imperial Oil is adopting the dual drilling plan and has spudded Imperial 44 in LSD 7, 23-50-26w4, as a D-2 test, offsetting No. 29, a successful D-3 producer. Imperial 25, LSD 4, 27-50-26w4, bottoming at 5,030 ft. got 221 bbl. on 8-hour test of the D-2 zone, after going dead for a considerable time. Four new Imperial tests have spudded, one is rigging, and six are in various stages of drilling.

Woodbend. — With Imperial-Woodbend 1, LSD 5, 15-51-26w4, in the northwest extension of Leduc field now in the last stages of testing, two other wells are being started in the same general area. McColl-Frontenac Oil Co., with backing from the parent company, Texas Oil Co. (U.S.) is planning to drill 12 miles west and 3 miles north of discovery. Continental of Canada has arranged to drill in NW¼ 7-51-25w4, 3 miles east of discovery.

Turner Valley.—In Turner Valley field, Home-Millarville 27, LSD 16, 18-21-3w5,

finished with Madison at 8,526-8,981 ft., has initial production of 319 bbl. Home-Millarville 30, LSD 7, 33-20-3w5, with Madison at 7,930-8,411 ft., flowed 22 bbl. an hour, and has been shut in, pending separate tests of each zone. Home Oil has two tests rigging and one drilling.

Bantry Lake.—In the Bantry Lake area, California-Imperial 11-2-18-13, LSD 1, 2-18-13w4, plugged back from 4,824 ft., is taking initial production of 150 bbl. a day from the basal Cretaceous, with possibilities of increase. The oil, 24.7° gravity, is shipped to the British-American refinery at Calgary, and is clean and water-free. Location for a second test in LSD 1, 11-18-13w4, is waiting for equipment.

Taber.—In the West Taber area, Taber-Province 85-15A, LSD 12, 15-9-17w4, has finished at 3,305 ft. with indications of an average producer and is awaiting definite production tests.

Steveville.—In Steveville - Princess field, Pacific 25-P, LSD 10, 8-19-11w4, at 3,360 ft., is making initial production of 190 bbl. with less than 20 per cent water cut.

OKLAHOMA

New Deep Production In Caddo County

THE Magnolia Petroleum Co. 1-A Miller, SE NW NE 14-6n-9w, Caddo County wildcat, after flowing 15 bbl. in 30 minutes from perforations at 10,650-55 ft., has been perforated with 48 additional shots at 10,635-50 ft. and is testing again. The well, on the Laverty structure north of the Cement field, was drilled to 13,046 ft. with casing set to the total depth and plugged back to 10,672 ft.

No official information is available on the current status of the Stanolind Oil & Gas Co. 1 Dora E. Wildman, NW NE NE 19-19n-11w, Blaine County wildcat, since the depth was reported at 9,027 ft. Field reports indicate that a core was taken from 9,027 to 9,052 ft. and the fact that the "tight" rule has been applied to the well has led to rumors that a good show may have been located in this zone.

Production from the Chimney Hill section of the Hunton lime was indicated for the Sinclair Prairie Oil Co. 1 Tulsa University "B," NW SE SW 33-3n-2w, at the southeast edge of the Antioch Southwest pool in Garvin County. A drill-stem test at 6,755-6,807 ft. showed gas in 10 minutes and at the end of the 2-hour test had recovered 30 ft. of clear 39.6°-gravity oil and 870 ft. of oil-cut mud. The hole is being conditioned and surveyed with electrolog. The well failed to find the Gibson sand in the Pennsylvania formation in which the other two University wells were completed as good producers.

Currently, the deepest drilling operation in the state is in Caddo County at Denver Producing & Refining Co. 1 School Land, C SE SW 16-10n-9w, where the operator is making hole below 15,276 ft.

The Peppers Refining Co. 1 F. P. Johnson, NW NE NW 1-12n-3w, Oklahoma County, flowed 150 bbl. per day through ½-in. choke and extended Witcher pool production to the south.

OKLAHOMA SUCCESSFUL WILDCAT

Pontotoc County: Southwest Natural 1 Hallum, NE SE NE 26-4n-6e, gaged 2,060,000 cu. ft. gas from Senora sand, TD 3,220 ft.

OKLAHOMA WILDCAT FAILURES

Garvin County: Republic Natural Gas 1 Harmon, SE SW SE 8-1n-2w, dry, TD 9,284 ft.

Osage County: Mason 1-A Osage, SW SE SW 20-25n-12e, dry, TD 1,691 ft.

Pawnee County: Mid-Continent 1 Maitlen, NW NE NE 17-23n-3e, dry, TD 4,137 ft.

Seminole County: Elm Oil 1 Orwig, NE NE SW 26-9n-7e, dry, TD 4,563 ft.

APPALACHIAN FIELD

Large Gas Well Made in Buchanan County

PITTSBURGH. — In Buchanan County, Virginia, southwest of McDowell County, West Virginia, United Producing Co. completed a large gas well in the wildcat on W. M. Ritter Lumber Co. in Garden district. It gaged 17,196,000 cu. ft. natural initial which settled down to 14,000,000 cu. ft. when shut in and is producing from the Maxton sand, total depth of 2,301 ft. On the Richlands Quadrangle, it is located 12,000 ft. east of 82 degrees 00 minutes and 2,000 ft. south of 37 degrees 15 minutes.

In Shady Springs district, Raleigh County, West Virginia, Godfrey L. Cabot, Inc., logged the Oriskany at 6,990-98 ft. in the wildcat 1,236 Russell & Doloff with a lime break following to 7,006 ft. where there was a series of sand strata 7,006-12 ft., 7,028-33 ft. and 7,040-43 ft. or to the present depth. Except for salt water showing in the Corniferous lime at 6,966 ft., there has been no showing.

New locations totaled 8 and in Laurel Hills district, Lincoln County; Trap Hill district, Raleigh County; Grant district, Wayne County; Oceana district, Wyoming County.

In Cecil Township, Washington County, southwest Pennsylvania, Hahn & Wally completed a large Thirty Foot gas well on their fee with a final gage of 4,700,000 cu. ft. and total depth 2,236 ft. This is the largest well in their operations and the largest completed in the township for years.

New work totaled five and in Manor and Rayburn townships, Armstrong County;

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SOUTHWEST PENNSYLVANIA WILDCAT FAILURE

Allegheny County, Hampton Township: Peoples Natural Gas Co. 1 Annie L. Duffy, dry, TD 2,954 ft.

WEST VIRGINIA WILDCAT FAILURES

Fayette County, Fayettville district: Godfrey L. Cabot, Inc., 1,258 Charleston National Bank, dry, Berea 3,305-25 ft., TD 3,425 ft.

Nuttall district: Columbian Carbon Co. 981 Nuttall Hrs., dry, Big lime 1,855 ft., TD 2,837 ft.

Jackson County, Ripley district: West Virginia Gas Corp. 548 Brady D. Hickel, dry, elev. 837 ft., Corniferous lime 4,988 ft., Oriskany 5,088 ft., TD 5,149 ft.

Wyoming County, Oceana district: Godfrey L. Cabot, Inc., 1,256 E. W. Bane, dry, Maxton sand 2,241-83 ft., Big lime 2,397-2,774 ft., Berea 3,331-68 ft., TD 3,400 ft.

VIRGINIA SUCCESSFUL WILDCAT

Buchanan County, Garden district: United Producing Co. V-1 W. M. Ritter Lumber Co., 17,196,000 cu. ft. gas, Maxton sand, TD 2,301 ft.

N. CENTRAL TEXAS

Throckmorton County Gets New 108-Bbl. Well

WICHITA FALLS.—In Throckmorton County, 1½ miles south of the Manning-Atkinson field, Fred M. Manning, Inc., 1-E Atkinson, Block 967, TE&L Survey, has been completed for 108 bbl. of 40°-gravity oil a day, from the Strawn at 2,552-80 ft., plugged back total depth. This well is a south offset to the company's 1-F Atkinson, Mississippi limestone discovery. The 1-E Atkinson found the Mississippi dry and operators had considered abandoning it as a dry hole when it was decided to plug back and test, according to reports.

Ten miles south of Trockmorton, Bridwell Oil Co.'s 5,000-ft. wildcat test, the 1 J. C. Irvin, Section 1, SPRR Survey, recovered 30 ft. of slightly oil and gas-cut mud on a drill-stem test of the Caddo limestone between 4,210-23 ft. Operators were drilling ahead.

In Clay County, Wichita River Oil Co. and Phillips Petroleum Co. 1 Edwards, S. C. Beldon Survey, found the Ellenburger dry to 6,313 ft., total depth, and was plugged back to 4,125 ft. to test a broken sand section in the Strawn which indicated oil possibilities while drilling. Operators had attempted a drill-stem test of the sand at 4,070-4,114 ft. but the well caught fire before the test could be completed, and a second test was not made.

Cities Service Oil Co. 1 Flowers, west offset to its Bend conglomerate discovery in northwest Wise County, topped the conglomerate zone at 5,251 ft. and drilled to 5,270 ft. for a drill-stem test.

West Central completions totaled 15, being 5 oil, 3 gas and 7 dry holes. Stephens County accounted for the 2 gas wells, and 1 dry, and Taylor and Eastland each had two completions. Brown, Callahan, Jones, and Comanche each reported 1 completed well. New locations totaled 25, in 11 counties. These were: Shackelford 8, Brown 3; Callahan, Eastland, Jones, Stephens and Throckmorton each 2; and 1 each in Comanche, Coleman, Haskell, and Taylor counties.

Twenty-nine completions, 14 oil, 1 gas, and 14 dry, were divided as follows: Archer 8, Clay 5, Young 4, Cooke 4, Wichita 3, Wilbarger 2, Montague 2, and Jack 1. Twenty-three new locations were in: Montague 6, Clay 6, Archer 4, Cooke 4, and 1 each in Grayson, Jack and Knox counties.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCAT (DISTRICT 9)

Young County: Star Oil Co. 3 L. F. Evans, Sec. 1,201, TE&L Sur., A-282, 3 mi. N Eliasville, flowed estimated 4,000,000 cu. ft. gas a day, Caddo 3,335-45 ft., TD 3,395 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES (DISTRICT 9)

Archer County: Cochran & Cain 1-F Virgil Seay, Blk. 69, J. W. Harris Subd., 8 mi. W Archer City, dry, TD 1,177 ft. in sand.

A. Kriss 1 M. B. Ray, Blk. 149, J. W. Harris Subd., 3 mi. NE Archer City, dry, TD 1,150 ft. in sandy lime.

Clay County: J. S. Abercrombie 1 W. M. Hoeffner, Blk. 12, Bosque Co. School Land Sur., 5 mi. SW Petrolia, dry, TD 6,032 ft., no tops reported.

Montague County: Kingery Bros. Drilling Co. 1 J. R. Womack, E. A. Walker Sur., 12 mi. NE Nocona, dry, TD 1,806 ft. in sandy lime.

WEST CENTRAL TEXAS SUCCESSFUL WILDCATS (DISTRICT 7-B)

Brown County: Central Texas Gas Co. 4 Will Cason, J. M. Baker Sur., 2½ mi. NW Thristy, flowed 5,000,000 cu. ft. gas a day, limestone pay 2,315-34 ft., TD.

Comanche County: Coats & Foster Drilling Co. 1 C. A. Scott, Wm. McClelland Sur., 2 mi. E Comyn, pumped 10 bbl. oil and 10 bbl. water a day, Mississippian (?) 3,526-28 ft., TD 4,302 ft., top Marble Falls 3,240 ft., Ellenburger 3,534 ft., elev. 1,378 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES (DISTRICT 7-B)

Callahan County: Woodley Petroleum Co. 1 Mary Murphy, Mary Anthony Sur. 767, 7 mi. NW Cross Plains, dry, TD 4,089 ft., base Caddo 3,204 ft., Mississippian 3,913 ft., Ellenburger 4,038 ft., small flow of gas 4,040-77 ft., elev. 1,905 ft.

Taylor County: Carl S. Schoults 1 I. N. Jackson, Alexander Thompson Sur. 20, 3 mi. NW Abilene, dry, TD 2,277 ft., Flippen 1,966 ft., King sand 2,160 ft.

E. H. R. Sabens 1 E. L. Hamilton, Sec. 33, Blk. 16, T&P Sur., 4 mi. W Abilene, dry, TD 2,642 ft., Coal 2,103-06 ft., sand 2,360-65 ft.

KANSAS

Sumner County May Have New Pool Opener

TESTING was started at the Anderson-Prichard Oil Corp. and Consolidated Gas 1 Frantz, NE NE NE 35-30s-2w, north Sumner County, after considerable gas and some oil were reported from the Mississippi. The well has been drilled to 3,779 ft. after topping the Mississippi at 3,736 ft.

The M. B. Armer and John Lindas 1 Hammeke, NW NW SE 21-21s-12w, Stafford County, has been completed as a pool opener and assigned a potential of 50 bbl. per day from the Arbuckle at 3,565-75 ft. The well is 1 mile east of the Mueller pool in northern part of the county.

Some wildcat territory in the west-central portion of Osborne County is to be tested by Westgate-Greenland Oil Co. at 1 Dean, SW SW SW 5-8s-14w. The nearest important production is in the Layton pool, some 15 miles to the southwest.

Casing has been set to 3,446 ft. to test a show of oil at the Vernon Oil & Gas Co. and Bennett & Roberts Drilling Co. 1 Smith, SW SW SW 23-12s-16w, in Ellis County. The show was in the Arbuckle, topped at 3,445 ft., and the reported total depth was 3,452 ft. The well is 1½ miles south of the Blue Hill pool.

For the week, 58 completions and 50 locations were recorded. Rice County had 8 completions, followed by Ellis with 7, and by Barton and Butler with 5 each. Barton County had 13 locations, to lead Rice with 8, and Russell with 5.

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KANSAS SUCCESSFUL WILDCATS

Hamilton County: Extension to Hugoton—Stanolind 1 Trussell, SW SW NE 28-26s-39w, 1,161,000 cu. ft. gas from 2,400-32 ft. and 2,456-80 ft., TD 5,879 ft.

Stafford County: Armer & Lindas 1 Hammeke, NW NW SE 21-21s-12w, 50 bbl. oil per day from Arbuckle at 3,566-75 ft.; Lansing 3,251 ft., conglomerate 3,504 ft., Simpson 3,547 ft., TD 3,575 ft.

KANSAS WILDCAT FAILURES

Barber County: Harbar Drilling Co. 1 Knorp, SE SE NW 26-34s-10w, dry, TD 5,414 ft., Lansing 3,880 ft., Mississippian 4,685 ft., Viola 5,090 ft., Simpson 5,183 ft., Arbuckle 5,374 ft.

Russell McGuire 1 J. T. Clawson, NE NE SW 17-30s-15w, dry, TD 4,890 ft., Topeka 3,142 ft., Heebner 3,790 ft., Douglas 3,861 ft., Lansing 3,984 ft., Kansas City 4,012 ft., conglomerate 4,577 ft., Viola 4,637 ft.

Barton County: Peel Drilling & Slageter 1 Stueder, SW SW NE 5-18s-11w, dry, TD 3,391 ft., anhydrite 610 ft., Heebner 2,934 ft., Lansing 3,052 ft., conglomerate 3,294 ft.

Butler County: R. W. Holcomb 1 Carl, NW NE NW 23-29s-3e, dry, TD 3,090 ft., Lansing 1,955 ft., Basal Kansas City 2,075 ft., Kansas City 2,287 ft., Mississippian 2,832 ft.

Pawnee County: J. M. Huber & Goodpaster 1 Foulton, NW NW NE 31-20s-17w, dry, TD 4,126 ft., Heebner 3,597 ft., Lansing 3,671 ft., Basal Kansas City 3,950 ft., conglomerate 4,058 ft., Arbuckle 4,089 ft.

Pratt County: Delta Producing & Harbar 1 Miller, SW SW NE 25-28s-12w, dry, TD 4,636 ft., Kansas City 3,721 ft., Mississippi lime 4,192 ft., Kinderhook 4,293 ft.

Reno County: Stickle Drilling 1 Graham, NE NE SW 8-26s-6w, dry, TD 4,231 ft., Lansing 3,031 ft., Mississippian 3,699 ft., Kinderhook 3,865 ft.

TEXAS GULF COAST

New Gas Field Tapped In Jefferson County

HOUSTON.—A new gas-producing area in western Jefferson County, 2½ miles north of Northwest Hamshire field, has been opened by McCarthy Oil & Gas Corp. 1 W. H. Wood et vir., in T&NO Survey, Section 65. Drilled to a total depth of 11,228 ft. and on initial test, the well flowed at the rate of 2,500,000 cu. ft. of gas per day with an estimated 28 bbl. of condensate. Flowing pressure on the tubing was 1,760 psi. Perforations are not available, but the well was credited with gas sands topped at approximately 10,448 ft. The 2⅞-in. tubing was set on packer at 10,440 ft. The hole has 7⅝-in. pipe cemented at 10,400 ft., with 138 ft. of 5½-in. lined cemented to 10,498 ft.

C. G. Glasscock, Jr. and Pontiac Refining Co. 1 T. A. McDonald, new discovery well in Calhoun County, approximately 6 miles southwest of Port Lavaca, flowed an estimated 52 bbl. at 41.5°-gravity oil through perforations at 7,268-69 ft. on an 8-hour drill-stem test using 7/64-in. choke, working pressure 1,440 psi. Well is now cleaning through a ⅛-in. choke, at the rate of 6 to 7 bbl. per hour, 40 per cent wash water, and the rest oil. This well is located in R. Garrett Subd. 1, in I&GN Survey 6, A-95.

Pan American Production Co. opened oil production from Frio sands in the old South Chenango gas area of Brazoria County. The company's 1 Joe Heim, Jr., in the Shubal Marsh Survey, Abstract 81-82, was drilled to a total depth of 10,750 ft., and plugged back to 9,390 ft. On test this well flowed 200 bbl. of 29.7°-gravity oil per day through a 10/64-in. choke, flowing pressure 1,100 psi., through perforations at 9,200-06½ ft.

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deep test ¾ mile north of nearest shallow gas production in the Egypt field, Alexander Edgar Survey, Wharton County, flowed a small amount of distillate and water with 600 psi. maximum pressure on initial test through perforations at 7,228-34 ft. The well is now shut in waiting on favorable weather.

There were 22 new locations reported for the Upper Gulf Coast, , of which 7 are wildcat starts, 1 each in Fayette, Harris, Jefferson, Lee, Matagorda, Walker and Washington counties. The Lower Gulf Coast received 14 new locations including 3 wildcat starts, 2 in Victoria and 1 in Jackson counties. One new oil field was opened in Wilson County while five wildcats were dry, one each in Brazoria and Wilson counties, and three in Harris County.

TEXAS GULF COAST (DISTRICTS 2 AND 3) SUCCESSFUL WILDCAT

Wilson County: New oil field, "Hart"—W. C. McBride, Inc. 1-A C. E. Hart in Simon & Juana Arocha hrs. grant, 3 mi. E of Floresville and 1½ mi. NE for Floresville field, top pay 587 ft., TD 592 ft., perf. 586-88 ft., IP: 19 bbl. net oil per day, on pump, no gas, grav. 16.8°.

TEXAS GULF COAST (DISTRICTS 2 AND 3) WILDCAT FAILURES

Brazoria County: The Texas Co. 2 E. H. Mays in Geo. Tennille Lge., off West Columbia northwest flank, dry, TD 9,296 ft.

Harris County: Haynes B. Ownby Drlg. Co. 1 Jos. F. Meyer, in John Ely Sur., 4 mi. W of Pierce Junction field production, 4½ mi. SW of Bellaire, dry, TD 4,044 ft.

Roeser & Pendleton, Inc. 1 E. E. Townes, in J. S. Ricketts Sur., 2 mi. NE of Cypress townsite, dry, TD 10,223 ft. in Wilcox.

Wright Drlg. Co. 1 Mrs. A. Letz, in Jas. Love Sur., 2 mi. SE of North Houston production, dry, TD 8,105 ft.

Wilson County: W. R. Quin and L. C. Quin 1 Emil V. Ploch, in Claiborn Rector Sur., 1 mi. NW of Calaveras and near Bexar-Wilson county line, dry, TD 3,331 ft., Edwards lime 3,257 ft.

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SOUTH LOUISIANA

Edgerly New Horizon Produces 81 Bbl.

NEW ORLEANS.—Sun Oil Co. 6 Hunter Co., 21-9s-11w, has opened a new oil sand at Edgerly pool, Calcasieu Parish. Drilled to a total depth of 4,226 ft., with top of sand at 4,104 ft., this well was completed for an initial production of 81 bbl. of oil per day through 9/64-in. choke, gas-oil ratio 279, gravity 25°. Production is through perforations at 4,104-35 ft.

Also in Calcasieu Parish, Sun 2 Louisiana Farm & Livestock Co., 7-11s-9w, has opened new gas-condensate sand at Moss Lake. On potential test this well flowed 39 bbl. of condensate per day and 2,332,000 cu. ft. gas per day through a 12/64-in. choke through perforations at 8,613-21 ft., with top of sand at 8,613 ft. Total depth is 9,350 ft. Stanolind Oil & Gas Co. 1-A Powell, 17-11s-9w, ¾ mile southeast of the Moss Lake discovery well, is making an initial test for production through perforations at 9,386-90 ft. Total depth is 10,501 ft., with plugged-back depth 9,421 ft.

A new shallower sand on the southeast side of the Weeks Island dome in Iberia Parish has tested some oil at Humble Oil & Refining Co. 2 R. H. Goodrich et al. Perforations were made in 7-in. pipe from 7,968-88 ft., 2-in. pipe was set at 7,953 ft., and the well flowed at the rate of 170 bbl. of 30.8°-gravity oil daily with a gas ratio of 555. The well started showing a slight amount of water and perforations were squeezed. Operators are now retesting in the same sand section with perforations at 7,968-76 ft. This test was originally projected to 12,000 ft., but went into the salt and bottomed at 8,139 ft.

Union Oil Co. of California is testing a new shallower sand in the Tigre Lagoon discovery area of Vermilion-Iberia Parish, at the 1 Emile Broussard located ½ mile south of gas production. Drilled to a total depth of 11,743 ft., the 5½-in. casing was cemented at 8,272 ft., and operators are running tubing for a production test through perforations at 8,141½-43½ ft. The field discovery in Iberia Parish produced gas and condensate from 11,480-500 ft.

There were 12 new locations reported this week including 1 wildcat start in Plaquemines Parish. Two successful exploratory wells were completed, opening 2 new sands, 1 each in Edgerly pool and Moss Lake pool, Calcasieu Parish. Four wildcat failures were reported, 1 each in Beauregard, Plaquemines, St. Landry and Washington parishes.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Calcasieu Parish: New oil sand Edgerly pool—Sun Oil Co. 6 Hunter Co., 21-9s-11w, TD 4,226 ft., top sand 4,104 ft., perf. 4,104-35 ft. IP: 81 bbl. oil per day through 9/64-in. choke, GOR 279, TP 210 psi., gravity 25°, no water.

Calcasieu Parish: New gas-condensate sand, Moss Lake pool—Sun Oil Co. 2 Louisiana Farm & Livestock Co., 7-11s-9w, TD 9,350 ft., top sand 8,613 ft., perf. 8,613-21 ft. IP: 39 bbl. condensate per day and 2,332,000 cu. ft. gas per day through 12/64-in. choke, GOR 60,488, open flow 11,000,000 cu. ft. gas per day, TP 2,880 psi., shut-in pressure 3,080 psi., gravity 55.1°, no water.

SOUTH LOUISIANA WILDCAT FAILURES

Beauregard Parish: O'Meara Bros. 1 Long Bell et al, 11-5s-7w, dry, TD 11,007 ft., Cockfield 7,905 ft.

Plaquemines Parish: Texas Co. 1-B State-Garden Island, Lse 1,001, in Garden Island bay, Twp. 23s-33e, 8,100 ft. S of

Garden Island production, dry, TD 4,904 ft.

St. Landry Parish: Texas Pacific Coal & Oil Co. 1 David Taylor, 22-3s-4e, in Richard townsite area, dry, TD 11,604 ft., Oligocene 6,998 ft., Cockfield 7,601 ft., Sparta 8,271 ft., Wilcox 9,600 ft., Cane River 9,583 ft.

Washington Parish: H. L. Hunt 1 W. A. Alfred, 15-1s-14e, in Angie area, 2 mi. E of Angie townsite, dry, TD 9,494 ft., Tuscaloosa 5,899 ft., Marine Tuscaloosa 6,383 ft., Lower Tuscaloosa 6,774 ft., Massive sand 6,915 ft., Lower Cretaceous 7,178 ft.

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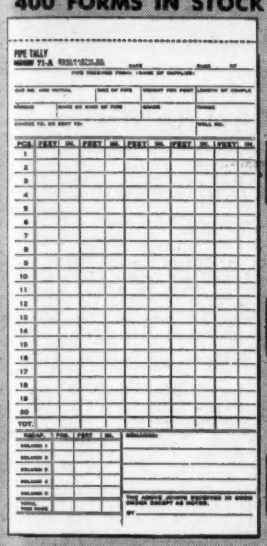

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SOUTHWEST TEXAS

Good Gas Flow Tested In San Patricio County

CORPUS CHRISTI.—A new gas field for San Patricio County has been opened 3 miles north of Mathis by Fred M. Manning 1 Ross-Singleton, in the I&GN Survey. Drilled to a total depth of 5,010 ft., on potential test it flowed 7,000,000 cu. ft. of gas per day on open flow (dry gas), with shut-in pressure of 1,560 psi., and no water in the flow. Production is through perforations at 3,490-95 ft.

Humble Oil & Refining Co. 2 A. J. Krause, discovery of a new pay level at Jourdanton field, Atascosa County, flowed on potential gage 108 bbl. of oil per day through a 3/32-in. choke (X-26 choke), with gas-oil ratio of 1,050. Tubing pressure was 1,435 psi., casing sealed. Production of 29.9°-gravity oil is through perforations at 7,155½-64 ft. This well is located in the Natascosa Colony Farm Subd. in James P. Gorman Survey 1189.

A north extension well at Farenthold field, in western Nueces County, Jack Little Trustee 1 F. W. Hackfeld, has been dually completed. From upper perforations at 5,604-07 ft., the well flowed 28.5 bbl. oil per day through 9/64-in. choke, with 200 psi. casing pressure, gas-oil ratio 300, no water in flow; and through perforations at 5,616-19 ft., it flowed 121 bbl. of oil per day through a 9/64-in. choke, with 700 psi. tubing pressure, gas-oil ratio 330, no water in the flow. Total depth is 5,621 ft., with 5½-in. casing on bottom.

Tom Graham 1 Louie Bailey, wildcat discovery well 1½ miles east of Agua Dulce townsite and 1½ miles west of Agua Dulce field, in Nueces County, has been completed as a gas well through perforations at 6,148-58 ft. Potential test flowed 13,100,000 cu. ft. of gas per day on open flow.

District 4 received 30 new locations, including 8 wildcat starts, 2 each in Duval, Jim Wells and San Patricio, and 1 each in Brooks and Hidalgo counties. Seventeen new locations were reported for District 1, of which four are wildcats, two in Caldwell and one each in Bexar and Edwards counties. One successful wildcat in San Patricio County opened a gas field, and a new oil pay was opened in Jourdanton field at Atascosa County. Ten wildcats were dry, three in Duval, two in Atascosa, and one each in Jim Hogg, La Salle, Medina, Willacy and Zapata counties.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) SUCCESSFUL WILDCATS

Atascosa County: New oil pay, Jourdanton field—Humble 2 A. J. Krause, in Natascosa Colony Farm Subd., James P. Gorman Sur., 1189, TD 7,658 ft., perf. 7,155½-64 ft., IP: 108 bbl. oil per day through 3/32-in. choke (X-26 choke), GOR 1,050, TP 1,435 psi., casing sealed, gravity 29.9°, 0.2 per cent water.

San Patricio County: New gas field—Fred M. Manning 1 Ross-Singleton, in I&GN Sur. A-172, 3 mi. N of Mathis, top pay 3,490 ft., TD 5,010 ft., perf. 3,490-95 ft., IP: 7,000,000 cu. ft. gas per day on open flow (dry gas), shut-in pressure 1,560 psi., no water.

SOUTHWEST TEXAS (DISTRICTS 1 AND 4) WILDCAT FAILURES

Atascosa County: Ray Clark 1 Wm. A. Harlan, S. D. Nelson and C. W. Nelson, in A. J. Murry Surv. 2, 4½ mi. NW of Anchorage, dry, TD 3,335 ft., Edwards lime 3,285 ft.

J. B. Burleson and D. C. Biggers 1 Marrs McLean, in J. Poitevent Sur. 7, 1 mi. SW of Lewis Oil Co. 1 McLean, southwest extension well at Charlotte field, and just east of Frio County line, dry, TD 2,117 ft.

Duval County: Bridwell Oil Co. 1 Felipe Martinez, in San Francisco (Juan Jose Manuel de la Garza Falcon) Gr., 1¾

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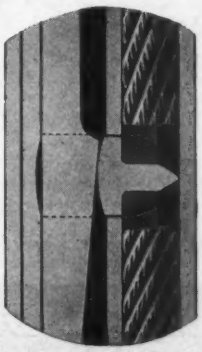

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mi. SE of Santa Cruz, dry, TD 6,363 ft. Continental Oil Co. 1-A Virginia Garcia, in Share 3, Santa Cruz de la Concepcion Gr., 2½ mi. E of Sejita field, dry, TD 6,006 ft.

Magnolia 2 Duval Ranch, Sec. 261, in BS&F Sur. 261, 10 mi. N of Freer and 3 mi. NW of Eagle Hill field, dry, TD 1,444 ft.

Jim Hogg County: J. A. Pearl et al 1 Andres Garza de Cuellar, in Sur. 86, 3½ mi. W-NW of Randado, dry, TD 2,508 ft.

La Salle County: Newman Bros. Drlg. Co. and Alaska Steamship Co. 2-E South Texas Syndicate, in T. Conlan Sur. 110, 20 mi. SW of Fowlerton, 2 mi. SW of Washburn field, dry, TD 3,293 ft.

Medina County: C. A. Dawson 1 B. F. and Julia May Ruby, in Rebecca Lathan Sur., 1¼ mi. N of Pearson, dry, TD 1,530 ft.

Willacy County: Humble 2 Sauz Ranch-Tenerias, in Share 64, San Juan de Carricitos Gr., 12 mi. NE of Raymondville, dry, TD 13,427 ft.

Zapata County: Green Valley Oil Co. 1 Anastacio Garcia, in Charco Redondo Gr., dry, TD 1,642 ft.

PERMIAN BASIN

Humble Starts Deep Test In "Benedum" Area

MIDLAND.—Humble Oil & Refining Co. has staked location for a 12,000-ft. Ellenburger wildcat 3 miles northwest of Slick-Urschel Oil Co.'s Upton County discovery. The new test will be the 1 Rosa H. Barnett, 1,980 ft. from north line and 660 ft. from east line of Section 4, Block Y, GC&SF Survey. Location is ½ mile south of the same company's 1 J. M. Parrott, which completed in July 1945 for 5 bbl. of oil a day from the Pennsylvanian at 9,100-9,884 ft. The 1 Parrott was credited with flowing some 50 bbl. of oil an hour after blowing out while drilling. Total depth was 10,744 ft., but it did not test the Ellenburger.

A western definition of Andrews County's Shafter Lake Devonian field was apparently established when Champion Oil Co. 1-D University, SW SE Section 24, Block 13, recovered 450 ft. of sulfur water on a drill-stem test from 10,000-10,700 ft., total depth. There were no shows of oil or gas at that interval, nor in any other of the Devonian, according to reports. Operators planned to plug back to test the Wolfcamp, which has had favorable shows in other wells in the field. The 1-D University, on an elevation of 3,268 ft., entered the Devonian at 9,885 ft., 416 ft. lower than the discovery well. Humble Oil & Refining Co. 2 Yarbrough & Allen, southwest offset to the discovery, finally hit the water table after previously logging 384 ft. of pay zone. The last-reported drill-stem test between 10,839-866 ft. recovered 400 ft. of fluid, of which the top 250 ft. was oil and the balance sulfur water. Operators were to run a test on the bottom 12 ft. to check on the water encroachment.

Southwestern Sterling County had prospects of a Lower Permian discovery last week at Anderson-Prichard Oil Corp. and Vickers Petroleum Co., Inc., 1 Marvin Frances Foster, Section 12, Block 15, H&TC Survey, about 10 miles south of Sterling City. A drill-stem test from 4,252-95 ft. had gas at the surface in 11 minutes, and oil in 54 minutes. It was allowed to flow into pits for 30 minutes, making an estimated 20-25 bbl. of oil in an hour. Some reports said the oil might be coming from the Wichita-Albany.

Winkler County had prospects of a new oil field, in the Tubb zone, 3 miles southeast of the Keystone fields, at Gulf Oil Corp. 125-E Keystone, Section 29, Block B-2. First test of the Tubb was between 6,470-6,535 ft. Gas came to the surface in

13 minutes and total recovery from the pipe was 175 ft. of 36°-gravity oil, and 120 ft. of oil and gas-cut drilling mud. It was deepened to 6,580 ft., and with packer at 6,535 ft., showed gas in 9 minutes and recovered 245 ft. of very heavily oil and gas-cut drilling mud, with no water. Operators estimated it to be one-half oil. Gas, at an estimated 58,000 cu. ft. daily, was about twice the amount shown on the first test. Operators said the test would be taken to around 11,000 ft. as originally planned.

Pecos County's distillate discovery, C. W. Chancellor and Slick Oil Co. 1 Thornton Davis, H&GN Survey, 2 miles west of Pecos Valley, ran a third drill-stem test of the Ellenburger, which indicated additional pay zone. At total depth of 9,230 ft., and packer set at 9,175 ft., a 40-minute test brought gas to the surface in 3 minutes, mud in 10 minutes, and 62° distillate in 12 minutes. Operators estimated the flow of gas to be around 10,000,000 cu. ft. daily, and yielding about 10 bbl. of distillate an hour. Recovery, from the pipe, was 150 ft. of distillate. Flowing pressure ranged from 3,550-3,800 psi., increasing to 4,250 psi. after a 10-minute shut in period. The first indicated the high-gravity production between 8,885-8,900 ft.

New locations for the week totaled 54, including 1 wildcat start each for Crane, Edwards, Reeves, Sutton and Yoakum counties. Locations, by counties, were: Hockley 9; Andrews, Crockett and Ector each 7; Crane 4, Pecos 3, Upton 3; 2 each in Gaines, Howard, and Lamb; and 1 each in Edwards, Glasscock, Reeves, Scurry, Sutton, Ward, Winkler and Yoakum counties.

WEST TEXAS (DISTRICTS 8 AND 7C) SUCCESSFUL WILDCATS

Crane County: Gulf Oil Corp. 1-S-A (previously identified as 1-E-A), Hattie Connell, NW SW Sec. 26, Blk. B-22, PSL Sur., 3½ mi. N Sand Hills field, flowed 1,805 bbl. 36°-gravity oil a day, ½-in. choke, GOR 261 cu. ft., Fusselman (Silurian), 8,355-65 ft., TD 9,915 ft., PB 8,375 ft., elev. 2,771 ft.

Howard County: Seaboard Oil Co. of Delaware 1-B J. C. Caldwell, Sec. 32, Blk. 32, T&P Sur., ¾ mi. from north line and 9 mi. from west line of county, about 8 mi. NW Luther, flowed 200 bbl. 43°-gravity oil a day, plus 40 bbl. salt water, 12/64-in. choke, Pennsylvanian 7,934-56 ft., elev. 2,639 ft., well was originally drilled to 6,700 ft. by Brown, Brown & Karcher, new TD 7,974 ft.

Scurry County: R-Y Oil Co. 1 J. H. Taylor, Sec. 133, Blk. 97, H&TC Sur., ½ mi. NW Ira, pumped 87 bbl. 25°-gravity oil a day, sand 2,961-3,170 ft., TD 3,216 ft.

WEST TEXAS (DISTRICTS 8 AND 7C) WILDCAT FAILURES

Irion County: Humble Oil & Refining Co. 1 J. M. Nutt, Sec. 7, Gonzales CSL Sur., ½ mi. E Mertzon field, dry, TD 7,786 ft., Strawn 7,565 ft., Ellenburger 6,666 ft., elev. 2,485 ft.

Terrell County: Irvin Svododa 1 J. M. Bassett, Sec. 1, Blk. 149, T&St. L Sur., 11 mi. NW Dryden, TD 2,180 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Magnolia Petroleum Co. 1-A Santa Fe, 30-9s-36e, San Andres discovery in the Crossroads area of northeast Lea County, made completion potential of 15.5 bbl. of 28°-gravity oil a day, plus some 10 bbl. of water. Pay zone is between 4,832-40 ft., which had been acidized with 1,500 gal.

Amerada Petroleum Corp.'s 2 H. S. Record, deep test in 25-19s-35e, Monument field, was last reported drilling at 12,165 ft. in unidentified limestone and shale. Culbertson & Irwin, Inc., 1 Murray, 9-22s-32e, 15 miles southwest of production in the Lynch field, was shut down for repairs at 4,744 ft. It is projected to 5,000 ft.

Gulf Oil Corp. last week staked location for an Ellenburger test in southeast Lea County, at its 1 Edith Fanning, NW NE 33-23s-37e. The well will be of particular importance since its location is 1 mile south of Gulf's 6 LaMunyon-Federal, Simpson discovery. Both wells are in the shallow Cooper-Jal area. The Simpson discovery flowed 42 bbl. of 42°-gravity oil in 30 minutes on a drill-stem test of the McKee section at 9,348-81 ft. Completion tests have been held up by stuck drill pipe at 9,555 ft.

ROCKY MOUNTAIN

Ohio's Hatfield Dome Well Flows 1,069 Bbl. Daily

DENVER.—Ohio Oil Co.'s second Hatfield dome well south of Rawlins at 2 U.P.R.R., C SW SE 35-20n-88w, Carbon County, Wyoming, flowed 1,069 bbl. of oil daily on tests of the Tensleep formation during the past week. The well is the second to be drilled to the Tensleep in this field, and is an extension ¼ mile north from the Tensleep discovery well completed by Ohio in October last year. The Tensleep was topped at 5,784 ft. and the well was drilled to 6,116 ft., total depth. Prior to the test the well was shot with 500 qt. of nitro between 5,800-6,065 ft. Drill-stem tests prior to shooting the sand showed only a small amount of oil. The Tensleep oil at Hatfield dome is 43° gravity.

Phillips Petroleum Co. and Kerr-McGee Oil Industries, Inc., are now deepening the Sheldon dome extension well at 1 Arapahoe, C NW NW 15-5n-2w (WRM), Fremont County, Wyoming, to the Madison after drill-stem tests established a new pay for the field in the Tensleep formation. The Tensleep was found at 6,762 ft. and at 7,068 ft., total depth, the operator bailed at the rate of 50 bbl. of 35°-gravity oil daily, with an estimated pumping potential of 100 bbl. daily. If the well is not productive in the Madison the operator will plug back and shoot the Tensleep and complete the well in that horizon. This test is only one location east of the discovery well on this structure, completed last year by Carter Oil Co. and Phillips as a 200-bbl. producer from the Embar. Embar in the present test did not show saturation, and Tensleep in the discovery well was too hard and tight to produce. Madison has not been previously tested in this field.

Carter Oil Co.'s south extension test to the Elk basin field at 8 Johnson-Watson, NE SE SW 8-57n-99w, Park County, Wyoming, is a failure in the Madison and the well has been plugged back for an extension to the Tensleep. The well was drilled to 7,233 ft., total depth, more than 800 ft. in the Madison, before being plugged back to 6,330 ft. where casing is now being run for completion. On drill-stem test 7,115-7,233 ft. the well made 1,860 ft. of salt water in 20 minutes. Previous drill-stem tests in the top of the Madison failed to show water. Following the discovery of oil in the Tensleep in this test, operators in the Elk basin Unit arranged to deepen the well in the Madison in an effort to assist in determination of a participating area for this formation. Two other wells in the Unit area have now been completed as producers from the Madison. One, Sinclair Wyoming Oil Co.'s Northwest Elk basin well, flowed 4,950 bbl. of oil in 24 hours for an initial, and extended the Madison productive area to the northwest and outside the Tensleep participating area. In the Tensleep the Carter Johnson-Watson made oil on several drill-stem tests, and approximately 50 acres will be added to the Tensleep participating area as a result of the successful completion of this well.

William Hanlon's 1 Government, NE SW NW 24-51n-93w, Big Horn County, Wyoming, found the Tensleep sand at 3,287 ft. and on a drill-stem test 3,285-3,294 ft. the well made 30 ft. of mud and 180 ft. of 34°-gravity oil with no water. Seven-inch casing has been cemented at bottom and the operator will perforate and test the well within the next few days. This well is ½ mile northwest of Stanolind's Tensleep discovery well on this structure, completed recently flowing 1,800 bbl. of oil daily from the Tensleep. Stanolind is now testing its 2 Orchard, ½ mile southwest of the discovery, in the Madison after finding water in the Tensleep. Top of the Madison in this well was found at 3,362 ft. and the well is now at 3,377 ft., total depth. Cores in the Madison showed some saturation

The Texas Co. is now in the process of abandoning an important wildcat test between Rangely and Douglas Creek fields at the North Douglas Creek Unit, Rio Blanco County, Colorado. The well is 1 Unit, SW NE SE 9-2s-101w. Weber was topped at 7,361 ft. and at 7,694 ft., total depth, drill-stem test showed 2,790 ft. of salt water cut mud, with no shows of oil or gas. This well found a small show of gas in the Morrison.

New operations.—There were 15 new locations in the region this week, with 7 of the wells in Colorado, 4 in Wyoming, 2 in Montana and 1 in northern New Mexico. The New Mexico location is Continental Oil Co. 122 in the new producing area on the south end of Rattlesnake. The operators have now completed three shallow Dakota sand wells in this area with only one of the wells a producer. The new location is in the NE SW SE 13-29n-19w, a west offset to the 1-mile extension well completed for 30 bbl. of oil daily last December. Two new Madison tests are scheduled for deepening from the Tensleep in the Lost Soldier field, making a total of four rigs in use in the field drilling Madison wells. Sinclair Wyoming Oil Co. made a Madison discovery in December at 77 Unit "A," which flowed more than 1,000 bbl. daily. Sierra Petroleum of Denver has moved in rotary to deepen a well in the San Francisco area, Las Animas County, Colorado. The test is 1-X Marchesio, SE

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that the lands listed herein are offered through sealed bids on the terms hereinafter specified, to qualified bidders of the highest cash amounts per acre as a bonus for the privilege of leasing the lands under sec. 17 of the Leasing Act of February 25, 1920 (41 Stat. 437; 30 U.S.C. sec. 181), as amended. All bids must be submitted to the Director, Bureau of Land Management, Washington 25, D. C., on or before 1 p.m. of the date set out herein. Each bidder must submit with the bid one-fifth of the amount bid in cash or by certified check on a solvent bank or by money order made payable to the order of the Treasurer of the United States, and file the showing of qualifications to receive a lease required under 43 CFR 192.42 (b) and (c). The envelopes should be plainly marked that they are not to be opened before the date and hour set out herein, and should show the number of the parcel and the name of the field. No bids received after the hour fixed herein for receiving bids will be considered. The remainder of the bonus and the annual rental must be paid and an acceptable surety bond in the sum of at least double the amount of rental, but in no case less than $1,000 nor more than $5,000, must be furnished by a successful bidder prior to the issuance of a lease. An acceptable $5,000 surety bond will be required prior to commencing drilling operations on the land. The deposits of the other bidders will be returned upon acceptance of the successful bids. Bidders are warned against violation of section 59, U.S. Criminal Code, approved March 4, 1909, prohibiting "unlawful combination or intimidation of bidders. The right is reserved to reject any and all bids. Royalties payable to the United States will be at the rate of 12½ per cent to 25 per cent for oil, and 12½ per cent to 16⅔ per cent for gas, in accordance with Schedule B in the lease form. Annual rental will be at the rate of $1 per acre. The land is offered in one parcel described as lot 2, sec. 33, T. 5 N., R. 19 W., S.B.M., California, 37.86 acres and is within the Mutual Field, undefined. It is also within the Los Padres National Forest and any lease issued for this tract will contain the forest stipulation required under 43 CFR 191.6 (Form 4-216 revised June 1947). Bids must be submitted on or before 1 p.m., March 10, 1946. Fred W. Johnson, Director.

SE NW 32-33s-62w, and was drilled by Barney Oil Corp. to 2,630 ft. in 1944. Shows of oil were encountered at total depth, but the well was suspended. Sierra will clean out and deepen the well, possibly to 5,000 ft. Other new operations in the region were pool wells.

Completions.—Thirteen completions during the week gave a total daily initial of 1,249 bbl. of oil for the Rocky Mountains. Four of the completions were in Wyoming, four in Montana, three in Colorado and two in northern New Mexico. Two wildcat tests were failures. In Montana Seaboard Oil Co. of Delaware suspended its wildcat test between the Clarks Fork-Northwest Elk basin area after finding water in all possible producing formations down to the Morrison. This well was located 1½ miles northwest of Sinclair Wyoming's Northwest Elk basin Madison discovery, completed last year flowing 4,950 Bbl. of oil daily. Frontier formation at the Seaboard test was more than 1,000 ft. lower structurally than in the Northwest Elk basin well. Sinclair completed an excellent extension well in the Frontier formation at Northwest Elk basin in 3 Wilkins, NE SW NW 28-9s-23e. The well flowed 328 bbl. of oil in 12 hours through open tubing with Basal Frontier at 3,430 ft. General Petroleum Corp.'s third well in the Sand Creek area, Washakie County, Wyoming, flowed 242 bbl. of oil daily through ¼-in. choke. Top of the third Frontier was only 25 ft. lower than in the discovery well, ¼ mile west, which was completed last fall. The Sand Creek Unit has not been tested below the Frontier although General Petroleum drilled an Embar discovery well at South Fork, 7 miles west of Sand Creek, last year. Other completions in the Rockies were pool wells.

WILDCAT FAILURE IN WYOMING

Shoshone, Park County: Trigood Co. 1 Beck, SW NE NW 27-53n-101w, 6,105 ft. TD, abnd., Muddy 2,192, Skull Creek 2,226, Dakota 2,615, Lakota 3,040, Morrison 3,060, Sundance 3,997, Chugwater 4,278, elev. 4,896 KB.

WILDCAT FAILURE IN MONTANA

Northwest Elk Basin, Carbon County: Seaboard Oil Co. 88-19-G, SE SE SE 19-9s-23e, 5,686 TD, temp. abnd., Peay 4,096, Fontier 4,145, Dakota 5,115, Lakota 5,290, Morrison 5,340. elev. 4,184 ground.

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OHIO, KENTUCKY

Sayre Pool Extended Further South

COLUMBUS.—The Sayre pool was extended another location to the south when John Morrow et al finished their 1 Ralph McLaughlin in Sec. 27, Bearfield Township, Perry County. The Clinton sand was reached at 3,828 ft., first pay at 3,838 ft., and 1,629,000 cu. ft. natural with 1,150 lb. pressure when through the sand.

The Clinton Oil Co. drilled in a good well on 1 Myrtie Forsythe, Section 28, Madison Township, Perry County. Clinton sand, topped at 3,274 ft., flowed 30 bbl. in 14 hours when 37 ft. in the sand. The best gage on the gas was 800,000 cu. ft.

The Wasson Co. 2 W. R. Herndon, Sec. 16, Salt Creek Township, Muskingum County, reached the Clinton at 4,072 ft. and found a gas pay of 4,000,000 cu. ft. natural at 4,096-4,106 ft. The well was finished at this depth and turned into the line. In Newton Township the Mid-East Oil 1 O. C. Williams, Section 23W, found the Clinton at 3,309-56 ft. with 150,000 cu. ft. of gas and a show of oil. After a heavy shot and the well shut in, the gage was 560,000 cu. ft., and only a small amount of oil.

H. Ray Helveson et al 1 Chas. Johnson, a semiwildcat in Section 8, Perry Township, Licking County, was drilled 22 ft. in the sand where it gaged 1,400,000 cu. ft. natural. Top of the Clinton was 2,889 ft.

New locations are still off with 14 reported from 7 counties. Stark County led with 4 and was followed by Muskingum, Perry and Meigs with 2 each. Seventeen wells were completed with Ashland field leading with 6.

EASTERN KENTUCKY

ASHLAND.—One big lime completion in Pike County was reported in Eastern Kentucky field.

Kentucky-West Virginia Gas Co. completed Well No. 5720 on the Albert Thacker property in Pike, at a total depth of 2,294 ft., with 252,000 cu. ft. production.

Several new locations were noted, Kentucky-West Virginia No. 5787, Elisha Branham, Pike; 5789, John H. Auxier, Johnson; 5790, Pike; 5797, John W. Jones, Floyd; 5799, Laban T. Minix, Magoffin, and 5801, Simpkins Keathley, Floyd.

WESTERN KENTUCKY

OWENSBORO.—In Daviess County, the Ashby Drilling Co. is waiting on tools to test the Tar Springs at the 1 Kin Adkinson, 14-P-28. The 1 A. Pendleton, 14-P-28, is also waiting on tools to test Palestine and Tar Springs.

The Carter Oil Co. 7 Margaret Drury, 1-O-20, Union County, on a drill-stem test got gas in 5 minutes and flow of clean oil in 1¾ hours at 2,575-78 ft.

The Sohio and Chester Oil Co. 1 L. C. Hayden, 8-N-27, Daviess County west of the Panther pool, is cleaning out and testing the Benoist at 1,798-1,815 ft. The total depth is 1,838 ft.

INDIANA

EVANSVILLE.—Pike County has good prospects for a new pool opener in the Stephen P. Laylor 1 Catt Heirs, SE NE NE 15-1n-9w, about 8 miles northwest of Petersburg and 1 mile from other production. Operator is setting casing to test saturated Jackson sand at 1,260-80 ft.

The Superior Oil Co. 1 Levi Tucker, NW NW SW 4-3s-11w, Gibson County wildcat, is set to perforate casing for a test of the McClosky lime at 2,439-47 ft. A drill-stem test of the Benoist, 2,223-34 ft., recovered 40 ft. of oil cut mud in 1 hour. The well is located southeast of the Owensville North pool. Total depth is 2,525 ft.

MISSISSIPPI

La Grange Gets Northeast Extension

JACKSON.—A 1,000-ft. northeast extension of La Grange field, Adams County, is assured at James E. Kemp 4 H. M. Marks in 8-6n-2w. As has been indicated by other wells in this extension area, the upper portion of the Wilson sand zone was shaled out with first porosity noted at 6,241 ft. Sand with oil stain and uniform fluorescence was cored to 6,251 ft., and, while the bottom 3 ft. had oil stain and odor, the fluorescence was dull to spotty at base, indicating the salt water level. Operators are drilling ahead to projected total depth of 6,300 ft. Approximately 3,600 ft. west and slightly north of the 4 Marks, Sohio-Roeser & Pendleton 1 De Marco, 8-6n-2w, has begun operations and is drilling below 3,300 ft.

At Heidelberg, Jasper County, Gulf Refining Co. 1 M. D. Riley, 19-1n-13e, cored to total depth of 12,672 ft. and is reaming core hole before coring ahead. Electric log was run while at depth of 12,563 ft. which indicated top of the limestone and anhydrite section at 12,255 ft. with first suggestion of a potential kick occurring at 12,508-56 ft. The cores through this interval were all nonporous limestone with some anhydrite streaks and inclusions.

Six locations were reported this week, one wildcat in Clarke County and five development wells, three in Baxter field, Lamar County, and one each in Gwinville field, Jeff Davis County, and Mallalieu field, Lincoln County. Three dry wildcats were reported, one each in Greene, Humphreys, and Yazoo counties.

MISSISSIPPI WILDCAT FAILURES

Greene County: Donald M. Reese 1 I. R. Anderson et al, 22-4n-8w, dry, TD 8,826 ft., Tuscaloosa 7,185 ft., Marine Tuscaloosa 8,023 ft., base Marine Tuscaloosa shale 8,272 ft., Massive sand 8,436 ft., Comanche 8,736 ft.

Humphreys County: Slick Oil Co. 1-A J. V. Hines, NW SW 21-14n-2w, dry, TD 7,008 ft., Tuscaloosa 6,617 ft., Comanche 6,740 ft.

Yazoo County: H. M. Haverbeck 1 C. C. Swayze, SW SE 14-12n-1e, dry, TD 6,008 ft., Wilcox 1,582 ft., Midway 3,605 ft., Selma 4,532 ft., Eutaw 5,425 ft., first Eutaw sand (Lammons equiv.) 5,542 ft.

ILLINOIS

New Deep Test in Wayne Has Show of Gas

MATTOON.—The first deep test in the area just south of Fairfield, Ill., recovered 150 ft. of gas and 30 ft. of gas-cut mud on a drill-stem test. The well is the Phillips Petroleum Co. 2 Book, SE NW SW 31-2s-8e in Wayne County.

The George and Wrather 1 M. Monroe, NE NW NE 27-2s-6e, Wayne County wildcat, was completed for 75 bbl. per day. Production is from 3,351-54 ft. and the total depth was 3,440 ft.

In Clay County, the Nash Redwine 1 G. McGee, SE SE NE 24-5n-6e, was completed for 42 bbl. per day from the Rosiclare lime at 2,814-21 ft. The well, located north of the Tolivar East pool, was drilled to a depth of 2,827 ft.

The John P. Booth 1 Nancy Green, NE SW SE 13-4n-2e, Marion County, is drilling at 2,990 ft. A two-hour drill-stem test at 2,394-2,404 ft. recovered 210 ft. of gas and 100 ft. of oil and gas cut mud.

ILLINOIS SUCCESSFUL WILDCATS

Clay County: Nash Redwine 1 G. McGee, SE NE NE 24-5n-6e, IP 42 bbl., Rosiclare, TD 2,827 ft.

Wayne County: George and Wrather 1 M. Monroe, NE NW NE 27-2s-6e, IP 75 bbl., McClosky, TD 3,440 ft.

ILLINOIS WILDCAT FAILURES

Effingham County: J. S. Feltis 1 Freedman, SW NE SE 21-7n-5e, dry, TD 2,478 ft.

Jasper County: E. T. Wix et al 1 J. E. Maginin, NE NW SE 34-6n-10e, dry, TD 2,875 ft.

C. H. Hart 1 Fehrenbacker, NE NW SE 11-5n-8e, dry, TD 3,139 ft.

Clay County: J. H. Gilliam 1 Hinterscher, NE NE NE 9-4n-8e, dry, TD 3,120 ft.

Marion County: Joe Dunbar et al 1 Stevenson, SW SW SW 29-3n-3e, dry, TD 2,371 ft.

Lawrence County: Ashland Oil & Refining Co. and Wiser 1 Smith, NW NW SE 34-4n-11w, dry, TD 1,913 ft.

Washington County: Milo Richey 1 D. Hallam, SW NE NE 27-1n-1w, dry, TD 1,493 ft.

Wayne County: National Associated 1 Galligar "C," SW SW NE 27-2s-7e, dry, TD 3,472 ft.

Jefferson County: George and Wrather 1 T. Witges, NE NW NE 31-4s-1e, dry, TD 2,828 ft.

Hamilton County: Kingwood 1 C. F. Downen, SW SW NE 10-5s-5e, dry, TD 3,562 ft.

West Edmond Pilot Gas-Injection Project Ready to Begin Operation

WITH the placing of a 225-hp. portable compressor, the first of four pilot gas-injection projects is scheduled to start this week in 30,000-acre West Edmond field of Oklahoma—the nation's largest unit operation. In addition, the operating committee of the West Edmond Hunton Lime Unit (operated by Sohio Petroleum Co.) has announced plans to spend approximately $1,000,000 for equipment for a field-wide injection program to follow the pilot projects.

Most of the lines have been laid for the pilot injection and operators expect no delay in getting started on this first project, which calls for the injection of as much as 2,000 M.c.f. of gas per day in the east-central part of the field. The critical scarcity of compressors and high-pressure pipe is causing some delay in starting the other three pilot gas-injection projects called for in the plan of unitization, but all should be under way on or before May 1.

It is contemplated that as much as 20,000 M.c.f. of gas daily will be reinjected into the reservoir with the four pilot-injection projects. With the field-wide program, it is anticipated that up to 110,000 M.c.f. may be injected. Pilot injection is being tried before embarking upon field-wide injection to assure the operating committee of the probable results before actual construction of the plant and system commences.

Field Gas to Be Used

Gas produced with the oil will be used for the pilot program. Much of this produced gas has been vented in the past. When the field-wide program gets into swing it may be necessary to purchase additional gas from outside sources and to cut off gas purchasers who have connections to the two gasoline plants serving the unit.

Produced gas has already been reduced to a minimum by shutting in 273 high-gas-oil-ratio wells and lowering the field's oil allowable from 45,000 to 35,000 bbl. daily. This allowable reduction was designed to permit production only of enough natural gas for plant requirements and field use.

Results Somewhat Uncertain

Since actual unitized operation was not achieved until more than 2 years after it was recognized as necessary, the outcome of the repressuring is somewhat less certain than it would have been 2 years ago. (Unit operation got under way October 1 of last year with Harold Pardee as manager, and Millard Neptune, assistant manager). Despite this, the operating committee at a recent meeting gave an 86 per cent favorable vote to the proposal to spend $1,000,000 to purchase equipment for field-wide injection.

It has been estimated that without unitization, approximately 24 per cent of the total wells in the pool would have been abandoned by 1952, and that by that time all producing wells would have been placed on the pump. By the end of 1957 all wells would have been abandoned. Under unitization, selectively shutting in of high-gas-oil-ratio wells alone may extend the producing life to 1959 or later. Wth a gas-injection program added, the producing life of the field is expected to extend to 1965 or later.

STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED FEBRUARY 14, 1948

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1948				
	Comp.	Oil	Gas	Dry	Footage	1948	1947	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	24	12	0	*12	25,098	225	191	0	0	0	0	0	0	0	0	0	0
Pennsylvania	44	20	3	†21	77,440	417	435	0	0	0	1	1	0	0	0	8	8
West Virginia	21	3	12	6	57,372	103	117	0	0	1	4	5	0	0	8	13	21
Ohio	17	5	6	6	38,665	139	170	0	0	0	0	0	1	0	2	4	7
Indiana	18	10	0	8	31,748	120	52	0	0	0	0	0	1	0	0	1	2
Kentucky	11	5	1	5	17,725	84	49	0	0	0	0	0	1	0	0	3	4
Illinois	39	21	0	18	105,355	272	242	2	0	0	10	12	7	0	0	44	51
Michigan	10	5	1	4	15,531	101	92	1	0	0	3	4	4	0	3	36	43
Kansas	58	28	8	22	194,682	374	339	1	0	1	7	9	6	0	1	42	49
Neb., Mo., Iowa	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Oklahoma	68	49	3	16	222,776	497	527	0	0	1	4	5	16	0	4	84	104
Texas	168	108	13	47	705,430	1,339	983	5	0	3	27	35	41	4	11	260	316
North Central (Dist. 7-B & 9)	43	19	4	20	133,686	397	316	1	0	2	7	10	18	0	2	92	112
West (Dist. 7-C & 8)	51	47	0	4	223,392	353	246	2	0	0	2	4	7	0	0	20	27
Panhandle (Dist. 10)	9	3	5	1	27,196	78	49	0	0	0	0	0	0	0	0	0	0
Eastern (Dist. 5 & 6)	8	4	1	3	42,596	76	66	0	0	0	3	3	3	0	0	24	27
Gulf Coast (Dist. 2 & 3)	24	15	1	8	125,638	225	207	1	0	0	5	6	8	3	3	62	76
Southwest (Dist. 1 & 4)	33	20	2	11	152,922	210	99	1	0	1	10	12	5	1	6	62	74
Louisiana	29	17	2	10	169,100	232	153	1	1	0	7	9	4	2	1	21	28
Northern	15	10	1	4	50,866	147	73	0	0	0	2	2	0	0	0	11	11
Southern	14	7	1	6	118,234	85	80	1	1	0	5	7	4	2	1	10	17
Arkansas	5	0	0	5	22,690	50	30	0	0	0	4	4	1	0	0	17	18
Mississippi	9	4	0	5	79,010	51	48	0	0	0	3	3	2	0	0	12	14
Southeastern States	0	0	0	0	0	6	8	0	0	0	0	0	0	0	0	5	5
Montana	4	3	0	1	12,769	34	23	0	0	0	1	1	1	0	0	6	7
Wyoming	4	3	0	1	21,406	53	27	0	0	0	1	1	3	0	0	4	7
Colorado-Utah	3	3	0	0	19,734	38	21	0	0	0	0	0	0	0	0	4	4
New Mexico	6	3	2	1	23,742	80	63	0	0	0	0	0	1	0	0	3	4
California	54	46	1	7	215,396	341	262	0	0	0	7	7	1	0	0	38	39
Total United States	592	345	52	195	2,055,669	4,556	3,833	10	1	6	79	96	90	6	30	605	731
Total previous week	583	357	35	191	2,076,294	3,964	3,239	18	4	3	63	88	80	5	24	526	635
Total February 15, 1947	594	313	76	205	2,070,952			14	0	7	92	113	75	8	22	499	604

Service wells included: *12, †20.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$2.17	....	....	....
19-19.9	2.19	....	....	....
20-20.9	2.21	$2.25	....	$2.12
21-21.9	2.23	2.27	....	2.14
22-22.9	2.27	2.29	....	2.16
23-23.9	2.30	2.31	....	2.18
24-24.9	2.34	2.33	$2.56	2.20
25-25.9	2.38	2.35	2.58	2.22
26-26.9	2.41	2.37	2.60	2.24
27-27.9	2.45	2.39	2.62	2.26
28-28.9	2.49	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.56	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.62	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point. †Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT, WEEK ENDED FEBRUARY 7

(Thousands of barrels)

District—	Crude runs, daily avg.	Production: Gasoline†	Kerosine	Gas & dist. oil	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	800	1,832	376	1,540	1,662	21,001	4,164	9,364	6,348
Appalachian:									
District 1	95	270	57	121	78	2,368	215	499	373
District 2	62	188	21	66	79	1,162	127	275	99
Ind., Ill., Ky.	833	2,693	469	956	1,066	20,112	1,946	4,789	4,138
Okla., Kans., Mo.	459	1,581	220	578	516	9,946	635	2,345	1,487
Inland Texas	263	1,057	117	191	426	4,035	361	396	843
Texas Gulf Coast	1,318	3,831	682	2,384	1,799	18,959	1,330	5,421	6,724
La. Gulf Coast	413	950	334	841	541	6,036	903	1,943	1,594
N. La. and Ark.	86	228	65	86	157	1,991	362	522	173
Rocky Mountain:									
New Mexico	11	32	4	10	26	92	25	17	32
Other Rocky Mtn.	152	429	33	183	341	2,687	146	734	648
California	856	2,385	90	914	2,463	16,711	905	12,233	27,798
February 7, 1948	5,348	15,476	2,468	7,870	9,154	105,100	11,119	38,538	50,257
January 31, 1948	5,434	15,986	2,561	7,690	9,141	‡102,988	‡11,719	‡40,607	50,839
February 8, 1947	4,788	14,684	2,422	5,159	8,413	99,759	13,441	44,867	46,701

*Finished and unfinished. †At refineries including natural blended. ‡Revised in "Other Rocky Mtn." area.

Bureau of Mines crude oil stocks 220,871,000 bbl. as of February 7—down 792,000 bbl. One year ago 220,313,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.

East Texas	$2.65	Pecos County, Texas (Yates)	2.35
Kettleman Hills, California*	2.14	Bradford, Pennsylvania	5.00
Beauregard Parish	2.66	Eastern Ill. and Western Ind.†	2.77
Illinois Basin	2.77	Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

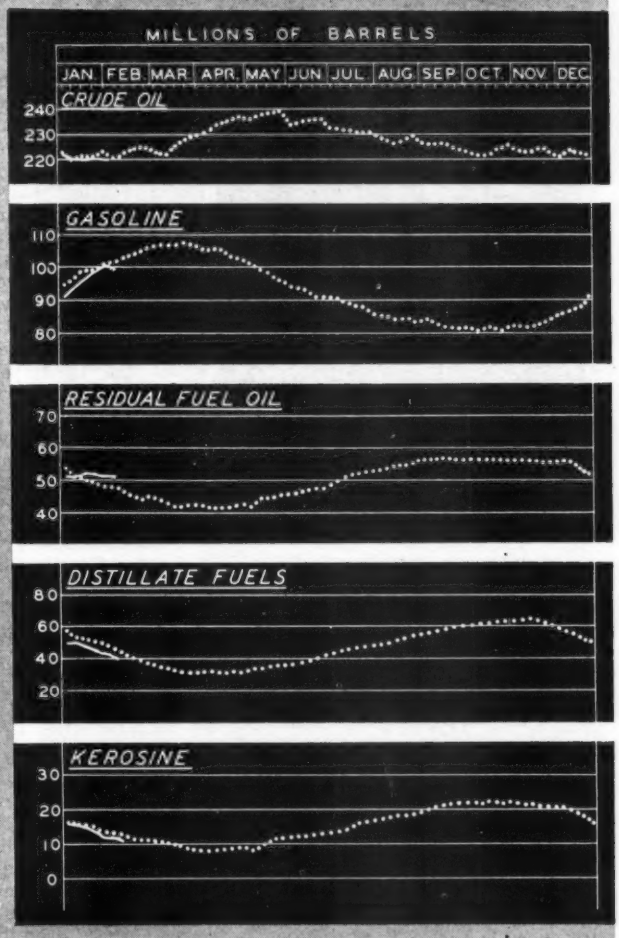
	Feb. 14 crude oil	B. of M. Feb. demand	Feb. 7 crude oil
Alabama	1,250	1,500	1,350
Arkansas	88,500	82,000	87,500
California	934,000	930,000	932,500
Colorado	45,210	47,000	46,870
Eastern	58,500	64,900	59,970
Florida	725	1,000	675
Illinois	172,600	182,000	174,700
Indiana	17,500	16,000	19,400
Kansas	274,250	305,000	271,800
Kentucky	24,900	26,000	25,700
Louisiana	476,400	465,000	474,150
North Louisiana	123,150	.....	120,900
South Louisiana	353,250	.....	353,250
Michigan	45,850	45,000	47,700
Mississippi	114,175	112,000	107,475
Montana	24,470	24,000	22,410
Nebraska	500	600	500
New Mexico	125,000	125,000	125,000
Oklahoma	408,800	410,000	409,350
Texas	2,432,825	2,360,000	2,432,825
Dist. 1 (Southwest)	25,700	.....	25,700
Dist. 2 (Southwest)	172,100	.....	172,100
Dist. 4 (Southwest)	254,675	.....	254,675
Dist. 3 (Gulf Coast)	498,450	.....	498,450
Dist. 5 (Eastern)	44,325	.....	44,325
Dist. 6 (Eastern)	122,500	.....	122,500
East Texas Field	315,000	.....	315,000
Dist. 7-C (West)	44,350	.....	44,350
Dist. 8 (West)	678,850	.....	678,850
Dist. 7-B (W. Central)	45,100	.....	45,100
Dist. 9 (N. Central)	145,425	.....	145,425
Dist. 10 (Panhandle)	86,350	.....	86,350
Wyoming	130,490	134,000	129,230
Total United States	*5,375,945	5,331,000	5,369,105
Change from prev. wk., up	6,840		

Total production January 1-February 14 . . †242,730,635 bbl.
Same period last year (crude plus cond.) 211,781,430 bbl.

*Not incl. 51,705 bbl. condensate. †Incl. 2,203,500 bbl. condensate.

STOCKS IN UNITED STATES

---- 1947 ——— 1948

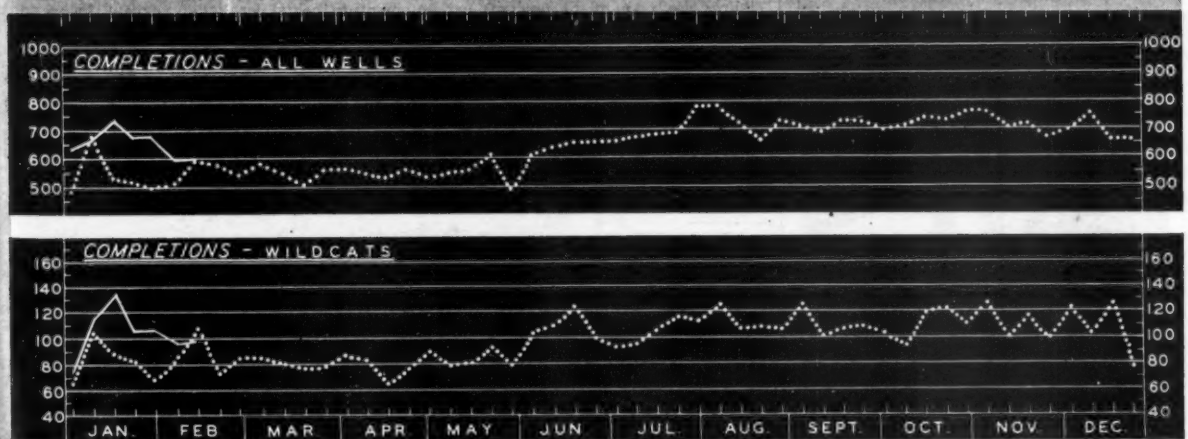


DAILY OPERATIONS

---- 1947 ——— 1948

WEEKLY COMPLETIONS

---- 1947 ——— 1948



TAPECOAT Those "Weak Links"

In Your Fight Against Corrosion...

It doesn't make sense to protect pipe with quality coatings and then use makeshift protection on pipe joints. After all, protection is only as good as its weakest joint.

That's why more and more distribution engineers are standardizing on TAPECOAT—the dependable wrapping in tape form that provides pipe joint protection equivalent to the mill coating on the pipe.

TAPECOAT is easy to apply. You simply spiral wrap the joint, starting and ending on the mill coated pipe, thus making the protection on the joint equal to the coating on the pipe. It will pay you to guard against those "weak links" with TAPECOAT.

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The TAPECOAT Company

1523 LYONS STREET EVANSTON, ILLINOIS

MARKETS

POSTED prices for all products throughout the country remained generally unchanged during the past week. Demand continued strong, particularly for fuel oil, in nearly all areas, although some break in the cold weather was evident. The drop in commodity market prices caused no noticeable effect on product prices in any area.

Eastern seaboard prices remained unchanged. In New York, fuel oil and kerosine remained exceedingly tight on the open market. It was reported that the Office of Defense Transportation will make available approximately 300 tank cars by February 23 to relieve the "pinch" in New York. The Navy fuel oil recently supplied to New York and used in the emergency pool is reported to be in need of replenishment.

Gasoline Stocks Up

Gasoline stocks in all areas generally continued to increase while fuel-oil stocks have steadily declined. However, a recent report by the A.P.I. said that the nation's fuel-oil stocks are holding up surprisingly well.

In Gulf Coast marketing circles last week some slight slackening of demand for motor fuel was reported, but requirements for heating oils of all grades continued extremely heavy. Spot-market gasoline at about 12 cents was not bringing as great a differential over contract postings as formerly. This was attributed to the usual winter drop in consumption and the use of all available tank cars to move heating oils.

A tank-car shipment of No. 2 at 12 cents was reported. Kerosine, on the Gulf Coast, was reported moving at 12½ cents on the open tank-car market. No. 6 appeared to be generally unchanged at $3.50 for cargo and $3.00 for tank-car shipments on the spot market.

Last week Standard Oil Co. of Kentucky advanced tank-car postings on housebrand gasoline to 11.3 cents per gallon at Savannah, Ga., Jacksonville, Port Everglades, Port Tampa, Fla., and Mobile, Ala.; to 11.4 cents per gallon at Pensacola, Fla.; kerosine at Pensacola to 10.8 cents a gallon, and at Mobile to 10.7 cents per gallon.

Mid-Continent Tight

In the Mid-Continent area fuel oil remained extremely tight on the open market. Some No. 2 was reported available at 12 to 12½ cents, buyer's cars. An offer of several cars of No. 2 was reported by one supplier at 14½ cents, Artesia, N. M. A slackening of gasoline demand was evident due to the generally bad weather.

One supplier in East Texas said that he could obtain some No. 2 at 13 cents. A North Texas supplier offered to move five cars of No. 2 at 11¾ cents, buyer's cars, and kerosine at 12¼ cents.

Tank cars continued to be scarce. Turnarounds in many cases were taking nearly twice as long as usual, according to one shipper.

One supplier in South Texas reported an advance in his lube prices of 1.5 cents for the lower viscosities of red and pale oil and 2 cents for the higher.

An easing of the natural gas situation was seen last week in Detroit's industrial areas with the order of Consolidated Gas Co. to resume deliveries of natural gas. Company officials stated that with normal deliveries further restrictions would not be necessary. The shutdown has been effective since January 28.

Representative Quotations

Representative spot-market quotations of leading suppliers as of February 16, 1943. Figures are f.o.b. plant for tank-car shipment in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	10½-11½	11.6-12* 10.5-12.2†	10.9-12.5
Premium gasoline, 78-80 octane	11¾-12½	10.6-13.4	12.9-13
42-44 w.w. kerosine	10-10½	9.8-10.8	10¼-12.5
No. 2 straw fuel oil	9½-11	8.9-9.9	9.05-12
No. 6 residual	$2.50-2.90	$3.03-3.90	$2.56-3.50

*Branded (74-76 octane); †Unbranded (74-76 octane).

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	8½	8	8¼
Grade 18-55	10.2	9.6	9.9

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	13-14.5
750 vis., No. 3-4 neutral	15-17.25
2,000 No. 5-6 neutral	17-18½

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	30-32
200 vis. No. 3 neutral, 0-10 pp.	20-21

Western Pennsylvania

145-155 vis. 10 p.t. bright stock	47
180 vis. p.t. neutral	45

CRUDE SCALE WAX

Mid-Continent

130-132 A.S.T.M. melting point	8½-9¼

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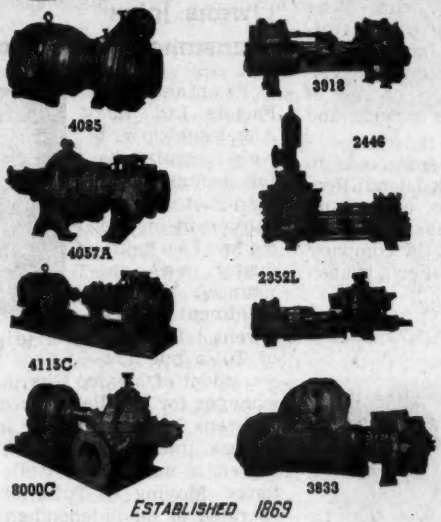

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EASY OPERATION
HIGH TORQUE
POSITIVE ENGAGEMENT
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* Anti-friction ROLLER CAMS — an exclusive feature — make ROCKFORD Over-Center CLUTCH operation extremely easy. A light pressure, lever controlled, toggle-joint arrangement moves the high point of the cams "over center"

Send for This Handy Bulletin

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With Damper Control

The most powerful Hydramotor Gas Valve of its size ever designed. Has ample damper power for louvres or secondary air doors. Handles natural, manufactured or L. P. gases. Sealed in oil for life. Motor driven hydraulic pump compounds high operating force. No gears to wear or lock. Simplicity and minimum friction insure extra years of life. Opens, 8 to 10 seconds. Closes, 2 to 3 seconds. Sizes, ¾" to 2½" I. P. S. Low or line voltage, all frequencies. For all kinds of industrial applications.

Request New Catalog 52D

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EQUIPMENT MEN ... in the News

Dearborn Chemical Appoints Goris

Dearborn Chemical Co., 310 South Michigan Avenue, Chicago, has announced the appointment of Earl J. Goris, graduate of Northwestern Commerce School, as advertising manager. He was formerly with Aubrey, Moore & Wallace, The Honolulu Advertiser in Hawaii, Wade Advertising Agency, and most recently, in the advertising department of General Electric X-Ray Corp.

Dearborn Chemical Co. are chemical engineers specializing in boiler-water treatment and rust preventives for railroad, marine, and industrial use. The Fensholt Co. is the advertising agency.

Minneapolis-Honeywell Opens Wichita Branch

A branch office serving Wichita and surrounding territory has been opened by the Minneapolis-Honeywell Regulator Co.

The manager for the new branch, located at 1514 East Central, is Lynn H. Johnson, Jr., who has been sales manager of the company's gas-controls division until his latest promotion.

Other personnel of the new office include Donald D. Baker, sales engineer for the industrial instrument division; Robert F. Perkins, sales engineer for the heating controls division; and Robert F. Jamison, air-conditioning-controls sales engineer. Lloyd Taylor will be in charge of air-conditioning-controls service and installation.

Baker has been transferred to Wichita from North Rock Island; Perkins from the Chicago office and Jamison from Minneapolis. Taylor, a native of Wichita, joined the company upon opening of the new branch office.

Bird to Shreveport

C. W. Bird, formerly service engineer, New England territory, has been transferred to Shreveport, where he will be in charge of all sales and service for the Louisiana, East Texas, and Southern Arkansas area of Bird-Archer Co., water conditioning engineers, 400 Madison Avenue, New York.

Bird joined the company shortly after he graduated from Purdue University, where he majored in chemistry and obtained a bachelor of science degree.

Salesmen from throughout the United States were in Houston recently for Mission Manufacturing Co.'s annual sales meeting. The sales force studied methods of improving service, learned about new Mission products, and discussed mutual sales problems. Present, and shown above, were: Front row—Melvin C. Davis, Denver; A. R. (Blondy) Parker, Kansas; Cecil Cardinal, Craig, Colo.; L. L. (Bud) Roberson, Bakersfield, Calif.; W. C. Underwood, domestic sales manager; F. S. (Shad) Mims, city sales representative; Joe E. Young, Oklahoma; J. E. (Chubby) Nolen, Jr., Lafayette, La.; Chas. W. Fryar, Wichita Falls; O. K. Ryan, Lubbock; W. T. Campbell; Dan J. Olire, Houston; Jack H. Bannister, Old Ocean, Tex.; and Jeff Tucker, factory representative, New York. Back row—Cobb L. Turner, Shreveport; Lonnie M. Roberson, Long Beach; John H. Bannister, Old Ocean, Tex.; A. E. (Higg) Higginbotham, Brookhaven, Miss.; Robert L. Creasy, sales office administrator; S. L. Heidemann, chief clerk; T. W. Adair, Jr., field serviceman and pilot; E. H. (Gene) Trammell, export sales manager; C. O. (Calvin) Bell, Jr., Mt. Vernon, Ill.; Wm. F. Bennett, Odessa; and R. W. (Rob) Chapman, Corpus Christi. Two members of the sales division are not shown. They are Tony Volotko and Joe Scalise, field servicemen

Owens Joins Transamerican Factors

W. OWENS

Transamerican Factors, Ltd., Los Angeles, export representatives for a number of manufacturers of equipment for the petroleum industry, has announced the appointment of W. Owens, formerly of Tulsa but now a resident of Mexico City, as resident manager for the Republic of Mexico.

Owens has been active in the petroleum industry since 1926, when he drilled a number of wells in Kentucky. Moving to Tulsa in 1928, he operated as an independent in Oklahoma, Texas, and Louisiana, and for a time was associated with Robert F. Garland, discoverer of Seminole field in Oklahoma. Later he became associated with W. R. Davis and spent considerable time in Europe and Africa. In 1939 he made extensive surveys in Panama and Colombia for Belgian Exploration Co.

The office of Transamerican Factors, Ltd., has been moved to Suite 502, Avenida Juarez 30, Mexico City, D. F.

McKnight and Carpenter Elected Directors

L. B. McKnight and O. W. Carpenter were elected directors of Chain Belt Co. at the annual stockholders meeting held at one of the company's West Milwaukee plants recently.

McKnight was selected a vice president of Chain Belt with executive responsibility for the two heavy machinery divisions of the company. O. W. Carpenter also was elected a vice president of the company in charge of finance.

Union Carbide Elects Priestley

Fred H. Haggerson, president of Union Carbide & Carbon Corp., announced the election of William J. Priestley as a director of the corporation. Priestley has been with the organization since May 1, 1923, and has been a vice president of the corporation in charge of the alloys and metals division since November 27, 1945.

Airco-Pacific Appoints New Vice Presidents

Appointment of four vice presidents has been announced by Air Reduction Pacific Co., the new subsidiary of Air Reduction Co., Inc., recently organized to take over the West Coast business of Air Reduction Sales Co.

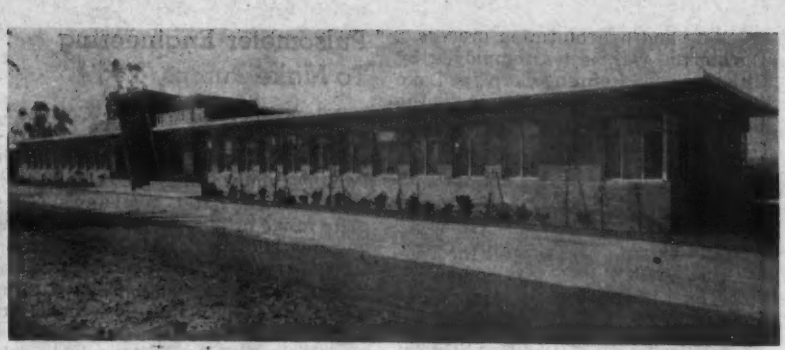
Names and respective districts of the new vice presidents are: L. A. Hamilton, Seattle; E. W. MacCorkle, Jr., Portland; H. W. Saunders, San Francisco; and H. A. Hoth, Los Angeles. The company's Seattle district, with offices at 3623 East Marginal Way, Seattle, includes nearly all of the state of Washington, the northern part of Idaho, and part of Montana. The Portland district, with offices at 430 N.W. 10th Avenue Portland, includes the state of Oregon, the southern half of Idaho and a part of the state of Washington in the vicinity of Walla Walla. The San Francisco district, with offices at 1485 Park Avenue, Emeryville, Calif., includes northern California north of the Kern County line, as well as most of northern Nevada and northern Utah. The Los Angeles district, with offices at 2423 E. 58th Street, Los Angeles, includes southern California, most of the state of Arizona, and parts of southern Nevada and southern Utah.

Wofford Transferred To Shreveport

D. F. Wofford has been transferred to Shreveport as sales engineer for the East Texas, North Louisiana, Arkansas, and Mississippi districts. Wofford has been associated with the Reed Roller Bit Co. since 1935, working in California, the Rocky Mountain area, Oklahoma, and Mississippi. During the war he served as a paratroop officer in the European Theater. After his discharge from the service Wofford was special representative for Reed Roller Bit Co. in South and Central America, spending considerable time in Trinidad, Venezuela, Colombia, Ecuador, Peru, Panama and Nicaragua.

Indig Elected President

Vic Indig, San Francisco export factory representative of Patterson-Ballagh Division of Byron Jackson, Overstrom & Sons, and Commercial Iron Works, was recently elected president of the Association of San Francisco Export Managers. Indig is located in Room 330, Russ Building, San Francisco.



International Cementers, Inc., has moved into its new office building at 6505 Paramount Boulevard in Long Beach. This completes the installation which started with a bulk cement and acid plant finished in 1945 and the Long Beach district warehouse, garage, and offices for cementing and chemical services completed in July 1947

Eutectic Appoints Leston

T. L. LESTON

Theodore L. Leston has been appointed vice president in charge of production of Eutectic Welding Alloys Corp., New York. The company manufactures and distributes special gas and arc welding rods, fluxes, and welding equipment.

A graduate of Arnstadt Polytechnic Institute in chemical engineering, Leston completed his metallurgical training at Faculte des Sciences, Paris, and New York University. At the Faculte, he worked under Madame M. Curie, covering preliminary phases of atomic research.

He was assigned to company projects in the research laboratories at the beginning of 1944. Thereafter, he guided several new arc welding electrodes and alloys through the pilot-plant stages to full production. He is a member of the American Society for Metals, American Foundrymen's Association, and the American Welding Society.

He became director of production in the late summer of 1947, and now assumes full charge of manufacturing approximately 100 types of gas and arc welding rods at 110 Duane Street, New York, where the company's newly-equipped seven-story plant is located.

Herbert to Colombia

Joseph C. Herbert, until January manager of B. F. Goodrich Co.'s newest tire and tube manufacturing plant in Tuscaloosa, Ala., has been named assistant managing director of Industria Colombiana de Llantas, Bogota, Colombia, a B. F. Goodrich associated company.

Hagan Corp. Opens Denver Office

Hagan Corp., Pittsburgh combustion and chemical engineering firm, recently opened a branch office in Denver, with W. C. Bennett as district manager. The new office is located at 2018 Blake Street.

Bennett, a veteran of 15 years with Hagan Corp., was in charge of engineering service in the St. Louis area from 1941 to 1947. Last November he was named district engineer for the company in an area comprising Colorado, western Texas, New Mexico, and Wyoming.

Maintenance Engineering Corp., which represents Hagan in a large area of the Southwest and in Mexico, extends its sales and service coverage to include additional territory in western Texas and southern New Mexico.

Maxwell Establishes New Company

Wilber A. Maxwell announces his operation under the name Maxwell Bailer Corp. as the exclusive agent for Grant Oil Tool Co. hydrostatic bailers and other cleaning tools in the Gulf Coast areas of Texas and Louisiana, with offices located at 6114 Long Drive, Houston.

Girdler Names Holdom

K. G. Holdom has been appointed eastern representative for the Gas Processes Division of Girdler Corp., Louisville, Ky. Holdom is a graduate of the Massachusetts Institute of Technology, and soon after receiving his degree joined M. W. Kellogg Co. With Kellogg he worked in the process division and also aided in the development of the fluid catalytic

cracking and hydroforming processes. During the war he was employed by Cities Service Refining Corp., at Lake Charles, La., and later joined the Houdry Process Corp. as a project-analysis engineer in the sales department.

Dowell Opens New District

L. B. SWAN

Dowell Incorporated announces the formal opening of its New Orleans district. This district includes South Louisiana, all of Mississippi, Alabama, and Western Florida and is the headquarters for all of the company's operations, both oil-field and industrial divisions, in this area.

L. B. Swan has been appointed manager of the new district and is now residing in New Orleans. Swan has been with Dowell since 1940 during which time he has had experience in all oil producing areas of the United States. For the past 4 years he has been located at the company's general office in Tulsa, serving as development engineer for the oil-field division.

The district office is located in New Orleans with R. L. Dickson as office manager. Dickson began work with Dowell in 1941 and has been located in Tulsa prior to the present time.

The new district includes the Dowell station at Lafayette, La., with C. L. Power, Jr., as development engineer and J. O. Hendrick as station manager; the station at Hattiesburg, Miss., with Z. V. Morgan as station manager; the Baton Rouge industrial area with L. G. Hargett as development engineer. The plans now include a future station to be located at Houma, La.

New Canadian Store

A new oil field supply store has been approved by National Supply Co., Ltd., at Edmonton, Alta., Canada. A. D. Foulds is local store manager.

Pulsometer Engineering To Make Pumps

Pulsometer Engineering Co., Ltd., Reading, England, announces a recently completed agreement with Pacific Pumps, Inc., (of California) whereby the latter company's complete range of pumps for oil refineries and oil-field services is to be manufactured at Pulsometer Reading Works. The pumps and spares will be interchangeable with those made in California. A special department has been set up at Reading to deal with all inquiries and advise on the selection of suitable designs, and materials for the various oil-refinery duties.

Butler Names Burns

G. A. Burns, manager of Butler Manufacturing Co.'s oil equipment division was named assistant general sales manager at the company's recent annual board of directors meeting. Burns is also a vice president of the firm.

Burns started with the Butler company at its Minneapolis office as a cost clerk in 1913. The following year, he was made salesman. In 1936, he became sales manager, Minneapolis oil equipment division. He was summoned to Kansas City in 1937 to become manager of the oil equipment and steel buildings divisions. Burns became manager of the oil equipment and special products division in 1942 when the steel buildings division was separated from oil equipment. For the past 3 years he has been manager of the oil equipment division.

Changes in Air Reduction Management

Charles S. Munson, formerly president of Air Reduction Co., Inc., New York, has been elected chairman of the executive committee. He is succeeded by John A. Hill, who becomes the fifth president of the company. William C. Keeley, formerly vice president, was elected chairman of the newly created finance committee. C. E. Adams remains chairman of the board of directors.

General Controls Names Maire

E. B. Maire has been appointed sales manager of the midwestern, southern, and eastern branch offices of General Controls Co., Glendale, Calif. These branch offices include: Boston, Philadelphia, Pittsburgh, Birmingham, New York, Detroit, Cleveland, and Chicago. As sales manager, Maire will assist and coordinate the efforts of the branch offices in the contact with original equipment manufacturers, wholesalers, and utilities in the sale of automatic temperature, pressure, and flow controls.

Lincoln Electric Names Clipsham

Lincoln Electric Co., Cleveland, announces the appointment of G. F. Clipsham to the position of assistant to the president. From 1935 until his recent return to the United States Clipsham was the president of Lincoln Electric Co., Welwyn Garden City, Herts, England. He went to England in 1935 to organize that company and during the past 12 years, through it, has been an important influence in the development and the extension of the use of arc welding in the British Isle. Clipsham joined Lincoln Electric Co. in Cleveland in 1929 and was active until he went to England as welding engineer in various sections of the country.

Edsall Appointed to Research Post

Richard L. Edsall, vice president in charge of research of James Thomas Chirurg Co., Boston and New York advertising agency, has been appointed to the National Committee on Research of the American Association of Advertising Agencies, effective April 1, 1948.

Edsall is a 1926 graduate of Harvard University. He joined the Chirurg agency in 1935 and shortly thereafter was appointed research director. In 1944, he became a vice president. Edsall is a former national membership chairman of the American Marketing Association and has also been sec-

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Above photograph shows the recently completed addition to the plant building of Otis Engineering Corp., Dallas, built at a cost of $50,000. The new construction, marked by awnings in front of the rear wing and duplicated on the opposite side, increases usable manufacturing, testing, and shipping space by 138 per cent